THE DIAGNOSIS AND TREATMENT

OF

VENEREAL DISEASES

IN

GENERAL PRACTICE

Published by the Joint Committee of Henry Frowde and Hodder & Stoughton at the Oxford Press Warehouse Falcon Square London E C

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VENEREAL DISEASES
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GENERAL PRACTICE

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SECOND EDITION

LONDON

HENRY FROWDE
Oxford University Press

HODDER & STOUGHTON
Warwick Square, E.C.

1919

PRINTED IN GREAT BRITAIN
BY HAZELL, WATSON AND VINEY LD
LONDON AND AYLESBURY

PREFACE

VENEREAL diseases have a double claim on our attention. They provide a field for scientific research which is of surpassing interest, and they levy a toll on our national resources which cannot be ignored.

As to the first of these I would say only that I have now introduced many members of the profession to the study of these diseases and have almost invariably found that a closer acquaintance with the subject has changed an attitude of indifference, or even disgust, to one of the keenest interest in the problems which they present.

But it is in the second respect that venereal diseases have the greater claim on our interest. It is certain that they are likely to be very much more widespread in the near future than they were in the past when already the inroads which they were making in our national resources were such as to create considerable alarm. When we consider the loss of efficiency which can be attributed to the gonococcus—the blindness of infants, the chronic ill-health and sterility of women, and the ill-health and impotence of men—and when we think of the fœtal and infantile mortality the loss of labour due to mental and bodily crippling of infants and adolescents, and the losses which the nation incurs through the cutting off of men in the most productive years of their lives, to mention only a few of the economic evils due to syphilis, we are bound to conclude that the combating of venereal diseases is a task of prime national importance.

It is a task, too which concerns not only public corporations and patriotic national societies, but every member of the medical profession Indeed I would venture to assert that without the active co-operation of the latter public bodies and societies will touch only the fringe of the subject With it, the evils due to venereal diseases could be reduced to negligible proportions for these reasons

There is little doubt that if every member of the medical profession knew thoroughly the simple technique of early diagnosis and treatment of venereal diseases, and carried it out if he acted promptly as he would in the case of any other infectious disease the good results which followed would quickly teach the general public that in these matters it pays to seek good advice and to follow it implicitly Every person indifferently treated means so many more clients for the quack, so many more innocent persons infected, and so much greater the unnecessary toll levied by venereal diseases on our national resources As it is now the duty of every citizen to pull his weight for the nation will not every medical practitioner realise his responsibility and act rightly in this matter? I have written this book in the hope of assisting him to do so

I am indebted for considerable assistance in the preparation of this work to articles in numerous works on venereal diseases and would mention in this connection Luys and Watson s works on Gonorrhœa, and the numerous articles to be found in *A System of Syphilis* by D Arcy Power and J Keogh Murphy especially that by Dr F W Mott, F R.S on *Nervous Diseases* For permission to reproduce many of the illustrations I am indebted to the following Messrs Doin et Fils Paris (figs 2 3 4 6 7 and 41) The Holborn Surgical Instrument Co (figs 8 64–6 68–70 and 74–80) Messrs Down Bros (fig 73) Messrs Ogilvy & Co (figs 56 and 57) Messrs Hearson (figs 59 and 60) Mr N Clarke (figs 58 61 and 62) Staff Sergt W L P Smith R A M C (fig 63) Captain A M Davidson R.A M C (figs 9 10 12 13 15 23 and 44) Captain

W Brown, R.A.M.C. (figs. 11 10 21 and 22) Major C. F White R.A.M C. (Tables III and IV) and Lieut. Colonel R. Bolam (Plate II, the original of which like those of Plates IV VI VII VIII, and XII, was painted by Mr S A. Sewell) I am glad also to have this opportunity of acknowledging the valuable help I have received from Mr C H. Mills in the form of much useful criticism during revision of the proofs, and from Mr Barlow of the Royal College of Surgeons, who prepared the index.

L. W HARRISON

ROCHESTER ROW S.W.1
January 28, 1918.

PREFACE TO SECOND EDITION

THE demand for a second edition of this work so soon after the appearance of the first is a welcome indication of the greater interest now being taken in Venereal Diseases.

The present edition differs little from its predecessor; the notable additions being a chapter on prevention and three plates illustrating various types of spirochetes under dark-ground illumination. These are from photomicrographs by Mr J E. Barnard President, Royal Microscopical Society I would acknowledge here my indebtedness to him and to the Medical Research Committee for the opportunity of reproducing these plates. With respect to microscopical technique in the diagnosis of Venereal Diseases, it may be of interest to practitioners to know that, thanks to the initiative of Mr Barnard a list has been prepared of microscopists in various parts of the country who are willing to assist them in any diffi-

culties they may experience The name of the nearest member of the Royal Microscopical Society who will assist in this manner can be obtained on application to the Medical Research Committee 15 Buckingham Street, Strand W C.2

L. W HARRISON

November 1918.

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CHAPTER I

EQUIPMENT REQUIRED FOR THE DIAGNOSIS AND TREATMENT OF VENEREAL DISEASES—THE EXAMINATION OF THE PATIENT

Equipment.—For the diagnosis and treatment of venereal diseases certain special appliances are necessary and a list of the articles which are most commonly used in venereal practice will be found in Appendix I.

It will be noted there that a microscope fitted with a dark-ground condenser is included in the outfit, and it may be asked why one should suggest by this inclusion that the practitioner should do work which is usually handed over to the pathologist. The reason will be plain to everyone who has had the advantage of controlling his diagnoses with the microscope. In early syphilis, for instance, the most efficient work demands that the diagnosis shall be made as rapidly as possible in order that treatment may be commenced without delay. This in turn requires facilities for microscopical examinations *ad libitum* and at short intervals, both of them requirements which the practitioner can fulfil only by doing the work himself. It may be argued that it is surely unnecessary to make a microscopical examination in every case; that most cases of syphilis can be recognised easily enough with the naked eye, and that this slavery to artificial methods must be detrimental to those powers of natural observation which we must preserve at all

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costs To these I would say that, doubtless a naked-eye examination may be sufficient in most cases *if made by a skilled observer* But the microscope is essential to the certain diagnosis of syphilis in its earliest stage before the primary sore has become, as one might term it typical and this is the stage in which we hope that the majority of patients will apply for treatment in the future. Further the written record of a well treated case of syphilis extends over many months during which clinical pictures fade from the memory and are not revived by the language of clinical notes While therefore such terms as typical Hunterian chancre etc. convey very little to those who know the varieties of lesions which are described as typical by different observers the simple note " Sp pallida present weighs more in the evidence at the end of six months or so than all the others put together As for the microscope impairing the powers of natural observation I adhere very strongly to the contrary opinion The lesions *must* be handled and scrutinised carefully for the purpose of taking a microscopic specimen and it is natural that whilst thus engaged the observer should mentally be speculating on his chances of finding the spirochæta pallida in it. A few minutes later he is putting his naked-eye impression to the test the two impressions are so to speak, planted closely together in his brain and nobody will deny that this must have a greater instructional value than if they are separated by a period of days or weeks I hold in fact that the worker who uses a micro scope in his diagnosis will learn more about naked-eye *appearances of syphilitic lesions in a month than he* will in a year without its aid As to gonorrhœa much that has been said about unlimited microscopical examinations applies here also Every urethral discharge and every thread found in the urine is not necessarily gonococcal though nobody could say which are not without the help of a microscope.

As to difficulties and fallacies the technique of micro-

scopical examination, both in syphilis and gonorrhœa, is simpler than most of those employed in medical practice. It is true that mistakes may be made at first, but the little trouble required to attain the necessary skill is more than repaid by the advantage obtained

As to the remainder of the equipment, neither urethroscope nor cystoscope has been included. Not because their value is denied but because they can be used to advantage only by those who have had the time and opportunity to practise their manipulation and study the appearances they afford Such practitioners must already possess works which afford much more information on the subject than could be included in this book.

It saves both time and energy if the diagnostic and therapeutic equipment is kept together so that when a venereal patient appears for advice and treatment the necessary appliances are ready for immediate use. When this article has to be obtained from one drawer and that from another the diagnosis and treatment of casual cases of venereal disease must be embarrassing and wasteful of time and energy which could be expended more usefully in other directions

Examination of the Patient.—Systematic examination always pays in medical practice and probably nowhere better than in the venereal department of it It is a good rule to insist at once on the patient unclothing sufficiently to allow of an examination of the whole skin and accessible mucous membranes The average patient, if allowed to do so would show himself by instalments and each step in the examination is then preceded by an irritating unfastening of buttons, which wastes much time and often results in an incomplete examination. A patient who is properly prepared can be examined in a systematic manner with astonishing ease and speed and the process of unclothing can proceed while the history is being taken down, or instruments prepared according to the case.

Age	Name	Disease
36	Blank, J	Syphilis II (ad).
Date of Admission April 9 1916.	Disposal	Date of Discharge

SUMMARY }

1st 2nd 3rd attack or relapse

Dates and Places of Three last Exposures { Caterham 2 months previous; " 1 month "; " December 14 1915

Main points in history.—First noticed sore on penis January 7th, 1916. Has washed sore daily with boric lotion. Rash appeared in mid-February also sore throat. No previous venereal infection.

Condition on admission.—1 SORE.—Oval ulcer dorsum of coronal sulcus, invading preputial fold and extending on to corona. Base indurated and surmounted by dry yellow exudate. Edges regular, not undermined, with well-defined areola surrounding sore by one-eighth of an inch from margin. 2. GLANDS.—*Marked inguinal adenitis and thickening of lymphatics along dorsum of penis.* General adenitis and post nor cervicals plus. 3. SKIN.—Profuse follicular papulo-pustular most marked on trunk. Macula "corona veneris" on forehead and maculo-squamous plaques over both ante-cubital spaces, flexures of knees and above ankles. *Moist papules axillae, umbilicus, scrotum and inner surface of thighs.* 4 MUCOUS MEMBRANES.—Fauces extensively ulcerated. Hypertrophic mucous plaques on left cheek and lower lip. Mucous erosions on tongue. Mucous patches and one condyloma right side anus. 5. NERVOUS SYSTEM.—Reflexes normal. OTHER SIGNS.—Complains of nocturnal headaches and pains in joints.

9/4/16. S. pall. present
Blood Was + + C.S.F { WASSERMANN 2 1 0·5 0·2 / + + − − / CELLS 20 PER C.MM. / GLOBULIN + — }

Weight 10 st. 8 lbs.
Heart and chest normal.
Urine—No blood, pus, sugar or albumen.

Date.	Treatment. Local.	Treatment. General.	Progress	Complications and their Treatment.
10/4/16	Calomel ointment to sore	606, 0·3, I.V. Hg. gr. I.		
14/4/16	—	606, 0·3 I.V.		
17/4/16	—	606, 0·3, I.V. Hg. gr I		
21/4/16	—	Hg. gr. I	Rash fading. No other signs	
1/5/16	—	606, 0·4 I.V. Hg. gr. I		
8/5/16	—	606, 0·5, I.V. Hg. gr. I.	No active signs of syphilis	
15/5/16	—	Hg. gr. I		
22/5/16	—	606, 0·5, I.V. Hg. gr. I		
29/5/16	—	606, 0·5 I.V. Hg. gr. I.		
31/5/16	—	—	Wassermann doubtful	
To have two weeks R I and resume on 15/6/16				
15/6/16	—	606, 0·3, I.V. Hg. gr. I		
22/6/16	—	606, 0·4 I.V. Hg. gr. I		
29/6/16	—	606 0·6, I.V. Hg. gr. I	Wassermann negative	
29/7/16	—	—	Wassermann negative	
29/8/16	—	—	Wassermann negative. C.S.F 10 cells	
	—	—	Wassermann negative 1 0·2. No globulin	

FIG 1 Venereal disease case-card. Front of card shown on top half, back of it below

Case Records—It is important that notes should be taken in all cases. The course of most venereal diseases is lengthy and it is practically impossible to remember accurately all the details of any one case A card such as that illustrated in fig 1 will be found a useful medium for the recording of notes, since it can be filed so easily

History—The history concerns the first appearance and subsequent progress of the lesion for which the patient is seeking advice and matters in the past which bear on it.

If the lesion appears to be due to a recent infection one enquires as to the dates of recent venereal exposures. A common mistake here is to ask only about the date of the *last* exposure. If this is done an early gonorrhœa and a venereal sore in the same patient may for example be ascribed to one recent exposure and the mind of the examiner is prejudiced against a diagnosis of coincident syphilis which might easily be the result of an earlier exposure. Useful information is often afforded by the patient s account of the first appearance of his lesion and if there are more than one the order in which they appeared

An enquiry should always be made regarding any treatment which has been applied up to date Caustic is often applied by patients to their sores and explains some very puzzling appearances Sometimes a patient has been injecting a remedy into his urethra which is the sole cause of his urethritis the previous application of antiseptics to a sore handicaps the chances of finding the spirochæta pallida in it and internal treatment may have a distinct bearing on the interpretation of a report on the Wassermann test of the blood serum. It may also explain the absence or irregularity of a syphilitic, or the presence of a drug rash.

As to the past, previous attacks of venereal disease and their treatment, as well as their relation in point of time to marriage are important The family history as regards miscarriages, still born children children who

died soon after birth or who suffered from eye diseases, deafness malformations and nerve diseases as well as the occurrence of *ophthalmia neonatorum in children and* chronic ill health both as regards the patient's own family and those of his parents, should always be ascertained Death of the father from a stroke at a comparatively early age, or from cancer of the tongue is always suggestive.

As regards the patient's own medical history prior to the appearance of the present lesions one's enquiries must vary greatly with each case and it is possible to mention only a few of the important points to be borne in mind when obtaining it A patient suffering from a late manifestation of syphilis will often deny in good faith any history of a sore but may give a history of gonorrhœa some years ago Such a history should arouse a strong suspicion that the gonorrhœa coincided with primary syphilis since in cases of combined syphilis and gonorrhœa the syphilis is often overlooked particularly when the primary sore is at the meatus or in the fossa navicularis The same applies naturally to the early venereal history of patients suffering from tabes and general paralysis where in fact it is very common to find that the early symptoms of syphilis were so trivial that they have entirely been overlooked A patient suffering from gonococcal epididymitis may honestly deny any history of gonorrhœa, since some attacks of gonorrhœa are so quiet that they may be overlooked by the patient.

Physical Examination.—As mentioned a thorough examination is essential if this always proceeds on systematic lines it need occupy very little time and few points will be overlooked The following routine may be found useful as a guide The examiner should wear rubber gloves and provide himself with a bowl of antiseptic lotion in which he should thoroughly sterilise his hands from time to time, especially before proceeding to examine the next case

Assuming that the patient is a man he stands before his examiner with his trousers dropped to his ankles and his shirt lifted to his axillae or better removed while the whole front of his trunk and legs is inspected including his penis inguinal glands, and the front of his scrotum and its contents. The investigation may by now have revealed the presence of acute gonorrhoea only and the temptation is to proceed with the examination which is particularly applicable to this disease as described later It is better however to proceed with the general survey and to return to the gonorrhoea later The hands and arms are examined not omitting palpation of the axillary and epitrochlear glands the latter just above the internal condyle in front. The patient then turns to one side for the examination of his flanks and the outer sides of his legs Turning now completely round the back is examined, and the patient made to stoop down as if to touch his toes while the buttocks are separated to disclose the areas in that region, including the anal orifice This is the most convenient position in which to inspect the skin of the scrotum, which is pulled backwards between the legs, putting it on the stretch and bringing out the characteristics of certain typical syphilitic lesions which may be found here.

The patient is then seated and his neck, scalp and face, nose eyes and ears dealt with in order The interior of the mouth is examined with the help of a spatula laid on the tongue, while the fauces, tonsils, soft palate, and the back of the throat are looked at in turn, and the spatula is pushed first into one cheek and then into the other to expose fully any lesions of these areas and to ascertain the state of the teeth. The patient then puts out his tongue, and after its dorsum and tip have been examined is told to touch the roof of his mouth with its tip and to push it first to one side and then the other in order that a good view of its under-surface and margins may be obtained He then turns out each lip

died soon after birth or who suffered from eye diseases, deafness malformations and nerve diseases as well as the occurrence of ophthalmia neonatorum in children and chronic ill health both as regards the patient's own family and those of his parents should always be ascertained. Death of the father from a stroke at a comparatively early age or from cancer of the tongue is always suggestive.

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CHAPTER II

GENERAL CHARACTERISTICS OF GONOCOCCAL, SYPHILITIC AND OTHER VENEREAL AFFECTIONS

VENEREAL lesions may be divided broadly into three groups Gonococcal, Syphilitic, and Simple erosive ulcerative or proliferative. An affection which belongs to one or other of these groups usually possesses certain characteristics, the recognition of which assists greatly in its diagnosis It may be useful to mention these before attention is turned to the diagnostic characters of the individual lesions encountered in the various regions of the body

General Characteristics of Syphilitic Processes —(1) The initial lesion of syphilis follows exposure to infection by a period which varies from ten days to a month or perhaps longer and is usually followed by generalised symptoms which recur again and again but in more and more limited distribution

(2) Unless complicated by septic infection syphilitic lesions are quiet and indolent being unaccompanied by signs of active inflammation so that, except in the case of some lesions in certain situations (such as primary sores on the digits fissures at the angle of the mouth, gummatous processes in bones and certain forms of iritis) they are not as a rule painful or tender nor do they itch

(3) The red colour which is seen in or about most syphilitic lesions is quieter than that which is usually associated with septic inflammatory processes It is not so bright as these, but tends to be more livid or if lighter in shade it has a yellowish or brownish tinge As is

in turn and this completes the examination of this very important region

The patient removes his boots and stockings for examination of his feet and toes and the routine examination is completed by testing the knee jerks and pupil reflexes.

Naturally if the patient complains of symptoms pointing to disease of some particular organ or system special attention is paid to that. Thus, his voice may proclaim the necessity of a laryngoscopic examination or nervous symptoms demand a more thorough examination of the nervous system and so on but failing special indications the above examination plus the taking of the necessary specimens for the laboratory is sufficient for the average routine case

The examination of women naturally differs somewhat from that of men but mainly as regards the genital organs This examination should take place on the table the dorsal position being chosen and the hips drawn well to the end of the table. After thorough cleansing with swabs, attention is paid in turn to the labia, clitoris urethra openings of the para urethral ducts beside the meatus and of Bartholin s glands and the posterior commissure as well as the perineum and the ischio-rectal region With the help of a speculum the cervix is exposed and the vagina examined As for the rest of the body it is inspected in much the same methodical manner as has been described for men

In making this methodical examination besides the careful scrutiny of the genitals there are some regions to which it is always well to pay particular attention These are between the buttocks and all places where surfaces by coming into apposition are constantly moist Here, as well as in the mouth *syphilitic lesions are found* most frequently and have the most typical appearances

If the examiner will habitually note down the features of every abnormality and ferret out its cause he will gain rapidly in diagnostic ability

many types of glandular enlargement by its quietness and freedom from signs of inflammation The enlarged glands appear as subcutaneous indiarubbery egg-shaped swellings, which are painless, do not become adherent to surrounding structures, and do not suppurate In the case of primary syphilitic lesions, the swelling is confined to the neighbouring glands and is usually much greater than that which accompanies the early eruptive stage. In fact, a large indolent swelling may give the clue to the position of an extra-genital chancre (submaxillary adenitis in primary syphilitic sore of the mouth or throat, for instance). The glandular enlargement which accompanies the secondary eruptive stage is generalised throughout the body Typical glandular enlargement may be absent, however and failure to find enlarged glands should not weigh against the diagnosis Suppuration of a gland, also, should not exclude syphilis.

(8) A characteristic of great importance in the diagnosis of syphilis is the manifestation of more than one sign at a time, so that although the individual lesions of syphilis may imitate closely those of other diseases help in diagnosis is obtained from the presence of many imitations on one person This emphasises the importance of the systematic examination, following which the summing-up of all the evidence assists greatly in settling a diagnosis which might be in doubt from the contemplation of one single lesion

(9) The micro-organism of syphilis, the spirochæta pallida, can be demonstrated in the exudate from all outward syphilitic lesions, though for practical diagnostic purposes, the evidence of its presence is sought for only in certain of them.

(10) From a very early stage of syphilis the blood shows certain changes, the most constant and easily demonstrated of which is its reaction to the Wassermann test.

As regards the general characteristics of syphilitic

well known the terms raw ham' and coppery have been applied to the colour of syphilides but I do not believe that either conveys any useful information to the average mind Very few people could match either raw ham or copper in the absence of a sample of each and I have seen the most various shades from bright inflammatory red to pale pink, likened to raw ham Although colour is a valuable sign in conjunction with others the shades of red adopted by syphilitic lesions are not their monopoly This is a point which seems often to be forgotten as it is not uncommon to meet patients suffering from various non-specific affections which have been diagnosed syphilis on the strength only of some such evidence as typical raw ham colour Sometimes too the red of a syphilide (for example, the early macules of a syphilitic roseola) is quite a bright shade, and it would be a mistake to label a lesion as non-syphilitic because it was not of the usual tint seen in syphilides

(4) When situated so that this point can be appreciated by palpation syphilitic lesions are usually associated with considerable induration being themselves hard and indiarubbery and surrounded by a zone of similar induration which underlies the apparently healthy skin or mucous membrane which adjoins the visible lesion

(5) They are always well embedded in the skin or mucous membrane which they affect, and by this characteristic can be distinguished from certain rashes which may resemble them in shape and colour but are *entirely* superficial.

(6) The outline of a syphilitic lesion is circular or oval and when it spreads the margin retains its circular form In cases of ulceration if a number of ulcers become confluent the margin of the resulting lesion is made up of the segments of as many circles

(7) The earlier stages of syphilis the primary and early secondary are usually accompanied by a characteristic enlargement of glands which is distinguished from

resemble syphilitic, are generally accompanied by more definite signs of inflammation being usually painful, and surrounded by a margin which is angry-red The surrounding infiltration is not nearly so dense nor does it spread so far beyond the margin of ulceration If neighbouring glands are affected these are generally painful and tend to suppurate Venereal non-syphilitic ulcerations have an incubation period of only a few days and are found on, or in close proximity to the genitals The spirochaeta pallida is not found in non-syphilitic ulcerations and the Wassermann reaction of the blood serum is negative provided that the patient is not also suffering from syphilis either acquired or congenital, or from one of the non-specific diseases which give a positive reaction (p 275).

Gonococcal lesions are generally associated with urethritis and the gonococcus can usually be found either in the urethral or prostatic secretion or in filaments contained in the urine On the whole gonococcal affections can be diagnosed with ease from either of the other two groups of venereal disease but in certain cases e.g. arthritis it may not be so easy to diagnose them from other joint affections.

Excluding gonococcal affections the task of prime importance in the diagnosis of venereal disease is to establish or exclude the presence of syphilis It is important to diagnose early since delay in commencing treatment greatly prejudices the chances of recovery It is important also to avoid falling into the error of supposing that the matter is ended by excluding syphilis when the patient first applies for advice. The incubation period of syphilis is considerably longer than those of the other venereal diseases, and since every one of these indicates an impure sexual connection with very probably an abrasion through which the spirochaeta pallida may have entered with the other germs, the patient should be kept under observation for not less than

processes in relation to the age of the infection the initial lesion is localised to the site or sites of infection and is generally single or comparatively *limited in numbers* while the spirochæta pallida can usually be demonstrated in it with ease If insufficiently treated the disease recurs again and again after varying intervals of apparent latency The lesions of the first recurrence are widespread over the whole body and the spirochæta pallida can be found comparatively easily in most of them. The lesions of each successive recurrence tend to be more and more limited in distribution bigger more circinate in character more deeply embedded less symmetrical and to result in more destruction of tissue until in the so-called tertiary stage the recurrence may be marked by a single or very few lesions which are large and deeply ulcerating The spirochæta pallida is found with increasing difficulty in the later lesions in which it is not profitable to search for them as a diagnostic measure

A plausible explanation of the change in the characteristics of the lesions which mark each successive recurrence is that, after the first eruption the tissues generally become more and more immune, so limiting the number of spots at which the spirochætes can gain the upper hand *Also* they become increasingly sensitive to any *fresh* manifestation of the spirochætes activity so that, in those places where spirochætes do manage to become active *again* the *response to their stimulus is enormous* in proportion to the number of spirochætes present there.

Symptoms pointing to disease of the central nervous *system* often occur in place of or accompanying the early eruptive stage and may recur or make their first appearance at any time up to death the characters of the symptoms changing with the age of the infection in a manner which is analogous to those which are found in somatic lesions

Non-syphilitic Ulcerative or Erosive Lesions, which may

CHAPTER III

LESIONS OF THE PENIS—GONORRHŒA

Venereal Lesions of the Penis may conveniently be divided into gonorrhœa and others. The latter may be subdivided into—

(a) Syphilitic sores

(b) Non-syphilitic fissures erosions, and ulcerations

(c) Mixtures of (a) and (b) and

(d) Papillomatous lesions

Gonorrhœa.—It will be convenient here to deal only with gonorrhœa affecting the penis and the structures which open into the urethra, including the bladder but excluding the epididymis and that portion of the vas d ferens which is outside the abdomen

Anatomy—A short account of the anatomy of the male urethra and adjacent structures so far as it concerns the diagnosis and treatment of gonorrhœa, is necessary in order that what follows may be more easily understood

The urethra is about 7 to 9 inches long It descends from the neck of the bladder in a downward and forward direction for an inch and a quarter to the superior fascia of the urogenital diaphragm (posterior layer of the triangular ligament), describing a curve with its concavity forwards and a little upwards (fig. 2) Continuing its downward and forward direction, it traverses the space between the superior and inferior fasciæ of the urogenital diaphragm for about three-quarters of an inch. Leaving the inferior fascia of the urogenital diaphragm (anterior layer of the triangular ligament) it enters the bulb of the corpus

two months from the date of his first appearance for advice.

The conditions which may be encountered during the systematic examination of the patient's body may now be considered in more detail with their main diagnostic features

cavernosum urethræ to the peno-scrotal angle here it curves downwards, following the pendulous portion of the penis to the glans, which it traverses to the external meatus The two curves which it describes in its course make together a rough S when observed from the right, the lower limb of the S being straightened out when the penis becomes erect

From the point of view of urethritis the urethra is divided into an anterior and posterior portion, that in front of the anterior layer of the triangular ligament

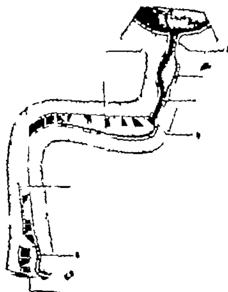


FIG 2. The lumen of the urethra, seen in a sagittal section. (From Luys after L. Testut.) 1 Bladder; 2. Cul-de-sac of the bulb; 3. Neck of the bladder; 4. Prostatic widening; 5. Narrowing at the membranous portion; 6. Neck of the bulb; 7 Penile narrowing; 8. Fossa navicularis; 9 Meatus.

being the anterior, and that behind it, the posterior urethra. Between the two is a water-tight barrier formed by the compressor urethræ.

That portion of the posterior urethra which stretches

cavernosum urethræ, where it gradually takes a forward and upward direction in the substance of the corpus

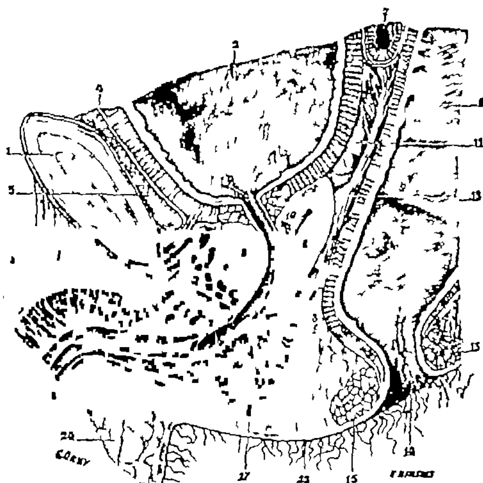


FIG. _. The posterior urethra and bulbous portions of the anterior urethra in sagittal section. Section through a frozen subject, passing slightly to the left of th middle line; the figure shows the right half of the section. (From Luys after L. Testut.) 1 Symphyis pubis; _ Bladder with its neck, 2 3. Anterior ligament of the bladder; 4 Umbilico-prevesical fascia of Farabœuf 5 Prevesical space; 6 Rectum 7 Recto-vesical fold f peritoneum, containing a loop of small intestine; 8 Prostate; 9 Verumontanum; 10 Left ejaculatory duct cut obliquely, 11 Right vas deferens; 12. Middle aponeurosis of the perineum, with Guthrie's muscle; 13. Prostato-perineal fascia; 14. Anus; 15 External sphincter of the rectum; 16. Cowper's gland; 17 Bulb of the urethra; 18. Spongy urethra; 19. Corpus cavernosum; 20 Suspensory ligament of the penis; 21 Deep dorsal vein of the penis; 22. Santorini's venous plexus; _3. Perineum; 24. Scrotum.

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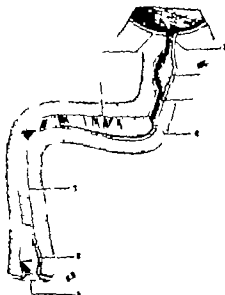


Fig 1. The lumen of the urethra, seen in sagittal section. (From Luys after L. Testut.) 1. Bladder; 2. Cul-de-sac of the bulb; 3. Neck of the bladder; 4. Prostatic widening; 5 Narrowing at the membranous portion; 6. Neck of the bulb; 7 Penile narrowing; 8. Fossa navicularis 9. Meatus.

being the anterior and that behind it the posterior urethra. Between the two is a water-tight barrier formed by the compressor urethræ.

That portion of the posterior urethra which stretches

from the neck of the bladder to the superior fascia of the urogenital diaphragm is surrounded by the prostate, and is called the **prostatic urethra.** It is about 1¼ inches long and is fusiform in shape (fig 8) being narrow below and above, and widened out in the middle opposite the verumontanum or crista urethralis. The latter structure is situated in the floor of the prostatic urethra, and is a narrow ridge of erectile tissue covered with mucous membrane which rises to its highest point opposite the middle, fading away to the bladder above and the rest of the urethra below

The portion of the posterior urethra which lies between the two fasciæ of the urogenital diaphragm is the **membranous urethra.** It is about ¾ inch long uniform in diameter and one of the narrowest parts of the urethra It is surrounded by the compressor urethræ muscle, which forms the only water-tight barrier between the bladder and the meatus

The **anterior urethra** becomes fusiform in shape on leaving the urogenital diaphragm and its floor forms a very slight cul-de-sac in the substance of the bulb The superior wall is more directly in continuity with the membranous urethra and is therefore the one which the tip of a curved instrument should be made to follow From the peno-scrotal angle in front of the scrotum to the glans the urethra is cylindrical Within the glans it widens out into a fusiform cavity about 1 inch long the **fossa navicularis,** which narrows down again at the external meatus where the urethra is at its narrowest.

The narrowest portions of the urethra are the external meatus the neck of the fossa navicularis which is about 1 inch behind the meatus and at the junction of the anterior urethra with the membranous portion of the posterior which is 5–7 inches from the meatus The widest portions are the fossa navicularis the bulbous portion and the middle of the prostatic urethra. The cross-section of the urethra forms a vertical slit at the fossa navicularis

a transverse or else a stellate one in the remainder of the cavernous and membranous portions and the shape of an inverted ∩ in the prostatic portion owing to the projection of the verumontanum, or crista urethralis from the floor at this point

The other structures which are important in relation to gonorrhœa are the prostate, seminal vesicles ductus deferens and ductus ejaculatorius, and the various glands which open into the urethra. The prostate is situated at the neck of the bladder and round the prostatic urethra. It is shaped like a horse-chestnut with its base above, and its apex just above the posterior layer of the triangular ligament or superior fascia of the urogenital diaphragm below (fig 2) It is $1\frac{1}{4}$ inches from base to apex, and $1\frac{1}{2}$ inches broad and is felt within the rectum about

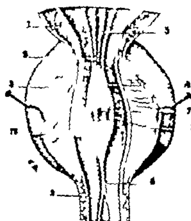


Fig. 4. Front view of the verumontanum. (By permission from Loys, after L. Testut.) 1. Bladder; 2. Urethra; 3 Prostate; 4. Verumontanum; 5. Frenum of the verumontanum; 6 Urethral crest; 7 Utriculus, or sinus pocularis; 8 Orifices of the ejaculatory ducts; 9 Prostatic fossette; 10 Openings of the prostatic glands (prostatic sinus).

$1\frac{1}{2}$ inches above the anus The prostate is composed of muscular tissue in which are numerous tubular glands, the ducts of which open in the prostatic sinuses, the

furrows which separate the sides of the verumontanum from the lateral walls of the prostatic urethra (fig 4)

The seminal vesicles, one on each side are sacculated pouches about 2½ inches long and ¼ inch thick, just above the base of the prostate (fig 5) They diverge at their blind ends where they are ½ inch across and converge to the middle line of the prostate where they are narrow and tubular Here each joins on its inner side with the

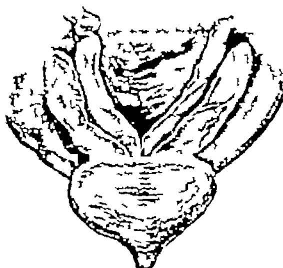


Fig 5. The posterior aspect of a bladder and prostate (Wallace) The vesiculae seminales and the vasa deferentia enter the base and n t the posterior surface of the prostate The vesiculae pass at first outwards in the vesico-prostatic groove and then upwards towards the ureters. Between the vasa deferentia is exposed a triangular-shaped portion of the bladder The direction of the vesiculae are shown too vertical even in this drawing, and the distance between a line joining the extremities of the vesiculae and the base of the prostate is too great. This is caused by the dissection necessary to show the parts.

corresponding ductus deferens to form the **ductus ejaculatorius**, one on each side The latter structures are narrow tubes ¾ inch long which pass down behind the middle lobe of the prostate and open into the urethra on each lateral slope of the verumontanum (fig 4) The orifice of a ductus ejaculatorius is 1/25 inch in diameter the duct having

lecreased in diameter from ¼ inch above to ⅟₁₂ inch below just above the orifice. The intimate connection between the prostate, seminal vesicles and ductus ejacu

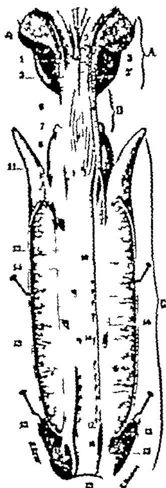


FIG 6. The urethra opened along it upper surface and spread out in order to show the details of t inferior and lateral surfaces. (By permission, from Luys after L. Testut) A. Prostatic portion; B Membranous portion; C. Spongy portion. 1 Verumontanum with the orifices of the ejaculatory ducts; 2 Frenum of the verumontanum; 3. Prostate with, 3' the prost tic glandules situated on the antero-superior aspect of he urethra 4 Section hrough the unstriped sphincter 6 Wall of the membranous portion 7 Cowper glands, with 7' the orifices of their ducts 8 Bulb; 9 Longitudinal folds of the bulbous and membranous portions of he urethra; 10 Posterior wall of the spongy urethra; 11. Roots of the corpora caver nosa 12. Septum between the corpora cavernosa, along which the urethra has been opened, 1 Orifice or lacuna, through which the meshes of the two corpora ca ernosa intercommunicate 13 T mination of the corpus cave nosum in an excavation in the glans; 13' Fibrous septum separating corpus cavernosum f m gl ; 14 S t n hrough the anterior part of the corpus spongiosum. 1 Glans 16. Fossa navicularis, with 17 the two halves of Guerin valve 18 Lacunae of Morgagni; 19 Meatus.

latorius and the urethra invites infection by the gonococcus in gonorrhœa, and prostatitis either acute or chronic, and vesiculitis are common complications. The narrow opening of the ductus ejaculatorius may also become almost

furrows which separate the sides of the verumontanum from the lateral walls of the prostatic urethra (fig 4).

The seminal vesicles, one on each side are sacculated pouches about 2¼ inches long and ¼ inch thick, just above the base of the prostate (fig 5) They diverge at their blind ends where they are ½ inch across and converge to the middle line of the prostate, where they are narrow and tubular Here each joins on its inner side with the

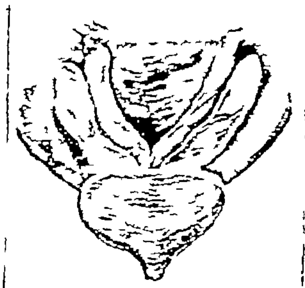


Fig 5 The posterior aspect of bladder and prostate (Walker) The vesiculæ seminales and the vasa deferentia cover the base and not the posterior surface of the prostate The vas deferens passes at first outwards in the vesico-prostatic groove and then upwards towards the ureters. Between the vasa deferentia is exposed a triangular-shaped portion of the bladder The directions of the vesiculæ are shown too vertical even in this drawing, and the distance between a line joining the extremities of the vesiculæ and the base of the prostate is too great. This is caused by the distortion necessary to show the parts.

corresponding ductus deferens to form the **ductus ejaculatorius**, one on each side The latter structures are narrow tubes, ¾ inch long which pass down behind the middle lobe of the prostate and open into the urethra on each lateral slope of the verumontanum (fig 4) The orifice of a ductus ejaculatorius is ½ inch in diameter the duct having

decreased in diameter from $\frac{1}{4}$ inch above to $\frac{1}{16}$ inch below just above the orifice The intimate connection between the prostate seminal vesicles, and ductus ejaculatorius and the urethra invites infection by the gonococcus in gonorrhœa, and prostatitis, either acute or chronic, and vesiculitis are common complications. The narrow opening of the ductus ejaculatorius may also become almost

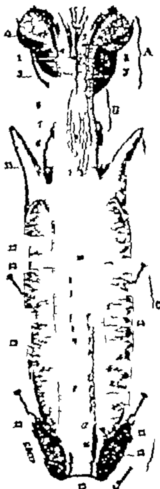


FIG. 6. The urethra opened along its upper surface, and spread out in order to show the details of its inferior and lateral surfaces. (By permission, from Luys after L. Testut.) A. Prostatic portion; B. Membranous portion; C. Spongy portion. 1. Verumontanum, with the orifices of the ejaculatory ducts. 2. Frenum of the verumontanum. 3. Prostate with, 3′ the prostatic glandules situated on the antero-superior aspect of the urethra. 4. Section through the unstriped sphincter. 6. Wall of the membranous portion; 7. Cowper glands with, 7′ the orifices of their ducts. 8. Bulb; 9. Longitudinal folds of the bulbous and membranous portions of the urethra; 10. Posterior wall of the spongy urethra. 11. Roots of the corpora cavernosa; 12. Septum between the corpora cavernosa, along which the urethra has been opened. 12′ Orifice or lacunæ, through which the meshes of the two corpora cavernosa intercommunicate. 13. Termination of the corpus cavernosum in an excavation in the glans. 13′ Fibrous septum separating corpus cavernosum from glans. 14. Section through the anterior part of the corpus cavernosum; 15. Glans. 16. Fossa navicularis with, 17. the two halves of Guérin valve. 18. Lacunæ of Morgagni; 19. Meatus.

furrows which separate the sides of the verumontanum from the lateral walls of the *prostatic urethra* (fig 4)

The seminal vesicles, one on each side are sacculated pouches about 2½ inches long and ¼ inch thick, just above the base of the prostate (fig 5) They diverge at *their blind ends where they are ¾ inch across and converge* to the middle line of the prostate where they are narrow and tubular Here each joins on its inner side with the



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decreased in diameter from [illegible] inch above to [illegible] inch below just above the orifice. The intimate connection between the prostate, seminal vesicles, and ductus ejaculatorius and the urethra invites infection by the gonococcus in gonorrhœa, and prostatitis, either acute or chronic, and vesiculitis are common complications. The narrow opening of the ductus ejaculatorius may also become almost



Fig. 6. The urethra opened along its upper surface, and spread out in order to show the details of its inferior and lateral surfaces. (By permission, from Luys after L. Testut.) A, Prostatic portion. B, Membranous portion. C, Spongy portion. 1, Verumontanum with the orifices of the ejaculatory ducts; 2, Frenum of the verumontanum; 3, Prostate, with, 3' the prostatic glandules situated on the antero-superior aspect of the urethra. 4, Section through the unstriped sphincter; 6, Wall of the membranous portion. 7, Cowper glands, with, 7' the orifices of their ducts. 8, Bulb; 9, Longitudinal folds of the bulbous and membranous portions of the urethra; 10, Posterior wall of the spongy urethra. 11, Roots of the corpora cavernosa; 12, Septum between the corpora cavernosa, along which the urethra has been opened. 13, Orifice of lacunæ, through which the meshes of the two corpora cavernosa intercommunicate; 14, Termination of the corpus cavernosum as an elevation in the glans. 14' Fibrous septum separating corpus cavernosum from gl ; 15, Section through the anterior part of the corpus spongiosum. 15, Glans; 16, Fossa navicularis, with, 17 the two halves of Guérin valve; 18, Lacunæ of Morgagni; 19, Meatus.

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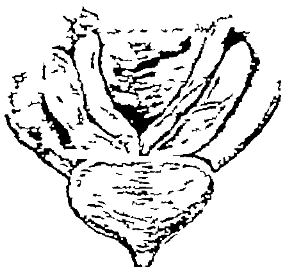


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decreased in diameter from $\frac{1}{3}$ inch above to $\frac{1}{12}$ inch below just above the orifice The intimate connection between the prostate, seminal vesicles and ductus ejaculatorius and the urethra invites infection by the gonococcus in gonorrhœa, and prostatitis, either acute or chronic, and vesiculitis are common complications The narrow opening of the ductus ejaculatorius may also become almost



FIG. 8 The urethra opened along its upper surface and spread out in order to show the details of its inferior and lateral surfaces. (By permission, from Leyshifter L. Testut.) A. Prostatic portion B. Membranous portion; C. Spongy portion. 1 Verumontanum, with the orifices of the ejaculatory ducts 2 Frenum of the verumontanum; 3. Prostate with, 3' the prostatic glandules situated on the antero-superior aspect of the urethra; 4 Section through the unstriped sphincter 6 Wall of the membranous portion 7 Cowper glands, with, 7' the orifices of their duct; 8. Bulb; 9. Longitudinal folds of the bulbous and membranous portions of the urethra; 10 Posterior wall of the spongy urethra 11 Roots of the corpora cavernosa; 12. Septum between the corpora cavernosa, along which the urethra has been opened; 12' Orifice or lacuna, through which the meshes of the two corpora cavernosa intercommunicate; 13. Termination of the corpora cavernosa in an excavation in the glans 13' Fibrous septum separating corpus cavernosum from glans; 14 Section through the anterior part of the corpus spongiosum; 15 Glans; 16. Fossa navicularis, with, 17 the two halves of Guérin valve 18 Lacuna of Morgagni; 19. Meatus

completely obstructed as a result of the inflammation of its margin

The glands and other structures which open into the urethra are of considerable importance from the point of view of gonorrhœa Besides the prostatic ducts and the ductus ejaculatorius on each side which have been mentioned are the following (fig 6)

Opening on the anterior urethra are Littré s glands Cowper s glands and the lacunæ of Morgagni Opening



Fig 7 Longitudinal section of the penis (By permission, from Luys' *Gonorrhœa*.) Normal aspect of the upper surface of the penile urethra, with its lacunæ of Morgagni and Littré glands.

on the membranous portion of the posterior urethra are Littré s glands and into the prostatic urethra, some rudimentary Littré s glands, and the utriculus prostaticus i e narrow blind tube which is situated in the middle of verumontanum and runs backwards for about ½ inch

under it from a point just in front of the highest point of its crest. Littré's glands are situated in the submucous tissue, and discharge on to the general surface as well as into the lacunæ of Morgagni by ducts of variable length which are directed forwards They are most numerous and well developed in the anterior urethra and are rudimentary in the posterior The lacunæ of Morgagni (fig. 7) are pouches of mucous membrane which project backwards under the neighbouring submucous tissues for a distance which varies from 1 or 2 millimetres to 6 or 7 As described by Luys they are like swallows nests, and there are about twenty of them opening on the anterior urethra. The larger ones are situated in the middle line of the dorsum, the intermediate and smaller ones in the lateral walls and floor of the urethra. Their mouths often become blocked in gonorrhœa, and the pouches converted to cysts.

The bulbo-urethral or Cowper's glands are situated in the substance of the compressor urethræ. They are racemose glands, about the size of a pea, and placed one on each side of the middle line in the angle between the bulb and the membranous urethra. They are separated from the bulb by the inferior fascia of the urogenital diaphragm through which their ducts pass to open in the floor of the bulbous portion of the anterior urethra.

Besides these harbours for gonococci, two others must be mentioned as they are often the cause of chronicity They are para-urethral canals which open either just beside the meatus or internally and Tyson's ducts which open beside the frenum.

It is small wonder with all these harbours of refuge which protect the gonococcus from irrigating fluids, that gonorrhœa is so resistant to treatment.

Symptoms and Course.—Gonorrhœa is due to infection of the urethra with the gonococcus, the diagnostic features of which are described on p. 242

It usually commences about three days after infection,

completely obstructed as a result of the inflammation of a lacuna.

The glands and other structures which open into the urethra are of considerable importance from the point of view of gonorrhoea. Besides the urethral ducts and the [illegible] which have been mentioned, are the following (fig. [illegible]).

Opening in the anterior urethra are Littré's glands [illegible] and the lacuna of Morgagni. Opening

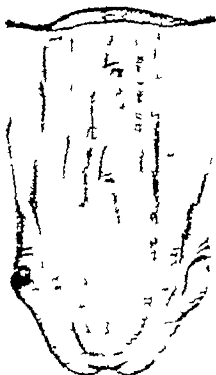


Fig. [illegible] [illegible] of the penis. [illegible] from [illegible] [illegible] of the [illegible] of the penile urethra, with the lacuna of Morgagni and [illegible].

in the membranous portion [illegible] posterior urethra are Cowper's glands and [illegible] some rudimentary Littré glands and the prostatic [illegible] the [illegible] which [illegible] in the middle of the verumontanum and runs backward for about [illegible]

under it from a point just in front of the highest point of its crest. **Littré's glands** are situated in the submucous tissue and discharge on to the general surface as well as into the lacunæ of Morgagni by ducts of variable length which are directed forwards. They are most numerous and well developed in the anterior urethra and are rudimentary in the posterior The **lacunæ of Morgagni** (fig 7) are pouches of mucous membrane which project backwards under the neighbouring submucous tissues for a distance which varies from 1 or 2 millimetres to 6 or 7 As described by Luys, they are like swallows nests, and there are about twenty of them opening on the anterior urethra The larger ones are situated in the middle line of the dorsum the intermediate and smaller ones in the lateral walls and floor of the urethra Their mouths often become blocked in gonorrhœa, and the pouches converted to cysts.

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Symptoms and Course.—Gonorrhœa is due to infection of the urethra with the gonococcus, the diagnostic features of which are described on p 212

It usually commences about three days after infection

completely obstructed as a result of the inflammation of its margin

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FIG 7 Longitudinal section of the penis. (By permission, from Lays' *Gonorrhœa.*) Normal aspect f the upper surface of the penile urethra, with its lacunæ of Morgagni and Littré glands.

on the membranous portion of the posterior urethra are Littré s glands and into the prostatic urethra some rudimentary Littré s glands and the utriculus prostaticus the narrow blind tube which is situated in the middle of the verumontanum and runs backwards for about ¼ inch

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Symptoms and Course —Gonorrhœa is due to infection of the urethra with the gonococcus the diagnostic features of which are described on p. 242

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FIG 7 Longitudinal section of the penis. (By permission, from Luys' *Gonorrhœa*) Normal aspect f the upper surface of the penile urethra, with its lacunæ of Morgagni and Littré's glands.

on the membranous portion of the posterior urethra are Littré s glands and into the prostatic urethra, some rudimentary Littré s glands and the utriculus prostaticus the narrow blind tube which is situated in the middle of the verumontanum and runs backwards for about ¼ inch

that the gonorrhœa is not cured as the patient so often thinks This chronic stage lasts anything from a few weeks to many years It may be accompanied by painful ejaculations, prostatorrhœa, or spermatorrhœa, and blood stained ejaculations. These are chiefly due to prostatic inflammation and to changes in the orifices of the ejaculatory ducts, and may result in sexual impotence. More often there are no particular symptoms beyond perhaps some uneasiness in the perineum and such as are due to the patient's anxiety over his condition Eventually as a result of the new-formed connective tissue laid down in the submucous tissues, urethral stricture may develop.

The constitutional symptoms depend upon the acuteness of the local attack, the patient himself the occurrence of complications, and at a later stage, the mental effect caused by persistence of symptoms In the acute stage a neurotic clerk with a moderate attack may be very depressed, lose his appetite and suffer from some fever with general malaise, while a plough-boy with a comparatively severe attack may not be greatly upset The later symptoms depend largely on the progress Chronic cases tend to neurasthenia if the patient is at all neurotic, and especially so if sexual functions are interfered with, but the average man leading a normal life does not seem to suffer greatly in his general health.

Complications —Various local complications may occur during an attack of gonorrhœa. They are peri-urethral abscesses, Cowperitis prostatitis vesiculitis, vasitis and cystitis inflammation of Tyson's glands, lymphangitis, and thrombosis of the dorsal veins of the penis. Indirect complications are balanitis, with phimosis and para phimosis. All these will be referred to in more detail when the diagnosis is considered

The complications which affect other parts of the body and will be mentioned when these are dealt with, are Epididymitis (p. 60), Ophthalmia (p. 140) Proctitis (p. 68) Arthritis, Teno-synovitis and Bursitis (p. 101),

but cases are fairly common in which the incubation period is as long as ten days and very exceptionally it may be prolonged to thirty five or forty days

The signs and symptoms are briefly as follows After one or two days of slight itching and uneasiness at the meatus there is a little mucoid discharge following which the secretion becomes much more profuse and purulent, being first thick, yellow and creamy but later greenish yellow and occasionally stained with blood The meatus becomes red pouting and possibly excoriated and the subjective symptoms are intensified There is a burning pain in the urethra especially on micturition painful erections at night, and sometimes chordee or erections in which the penis is bent over in an arch or to one side or the other The inflammation spreads backwards and symptoms may be increased after some days by the occurrence of acute posterior urethritis which is manifested by great frequency of micturition strangury burning pain in the deep urethra and possibly the passage of a few drops of blood at the end of micturition with perhaps great reduction in the amount of visible discharge and increase in the frequency of erections Much more frequently however posterior urethritis is discovered only when the urine is examined It occurs as a matter of fact, in at least 80 per cent of cases but in the majority there is no particular increase of subjective symptoms

The acute symptoms usually subside after ten or twelve days unless acute posterior urethritis has set in and give way to a sub-acute stage in which the discharge becomes mucopurulent and progressively less in quantity In favourable cases the discharge ceases altogether after four or five weeks from the commencement

Very frequently however the discharge does not cease completely but there remains a small clear drop of discharge or slight stickiness of the lips of the meatus in the morning With or without this morning gleet, there is often other evidence in the form of threads in the urine,

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Iritis (p 150) Endocarditis (p 156) and Hyperkeratosis blenorrhagica (p 108)

The course of gonorrhœa varies enormously and nobody can say how long a given attack will last I have seen many attacks clear up in ten days but in the average case the visible symptoms in the form of urethral discharge last four to six weeks and for a variable time longer the presence of threads in the urine shows that the patient is not yet cured Relapses are common and the intractability of gonorrhœa is proverbial

The reasons for the great tendency of gonorrhœa to become chronic require some little discussion as they affect the principles of treatment. The main ones are as follows

(1) There are some grounds for believing that the tissues do not put forth the same antibody response to gonococcal as to some other infections such as, for example, that of the micrococcus catarrhalis which is probably a closely allied micro-organism If one compares the effect of an autogenous catarrhalis vaccine on another mucous membrane lesion—a common cold—with that of an autogenous gonococcal vaccine in gonococcal urethritis, the difference in favour of the catarrhalis effect is very great It cannot be argued that the urethra is more extra vascular than the nose, and one can attribute it only to the difference in the antibody response. Possibly this is because the gonococcus is more parasitic, less saprophytic, and less foreign to human tissues than the catarrhalis but this is going beyond the scope of this book.

(2) The urethral mucous membrane is so sensitive that strong bactericidal solutions cannot be applied to it without causing serious permanent damage The margin between bacteriotropic and organotropic strength is narrower here than almost anywhere

(3) The gonococcus tends to bury itself deeply in the mucous membrane

(4) It has a predilection for the gland ducts and other canals which open on the general surface of the urethra. Its attack on these frequently causes closure of their mouths, with the result that affected *glands* become closed cavities containing pus and gonococci. These evacuate their contents on to the mucous membrane from time to time, and cause recurrences long after the general mucous membrane has healed. It is very easy, therefore, to understand how the gonococcus, though a comparatively delicate organism, can defy such bactericidal solutions as may be applied to the mucous membrane of the urethra whilst lying snugly below it or in gland ducts safely removed from contact with these solutions.

The *diagnosis of gonorrhœa* is easy in acute cases with profuse purulent discharge. It may be very difficult in old cases where the sole evidence of disease is some slight discharge or only threads in the urine, and the question arises whether these are due to the gonococcus or to some other cause. It may also be very difficult in those cases where, without present signs of disease, it is necessary to tell the patient whether or not he is cured.

In acute cases only three pitfalls need be mentioned.

(*a*) A discharge from the mouth of the prepuce does not necessarily indicate gonorrhœa. It may be due to balanitis, and urethritis should be diagnosed only when the discharge is seen to be coming from the urethra. Failure to observe this precaution is constantly leading to errors in diagnosis. A patient complains of a discharge, pus is seen issuing from his preputial orifice, and it is at once assumed that he is suffering from gonorrhœa.

(*b*) Although acute urethritis is almost always due to gonorrhœa, the rule is not absolute, and it would be a mistake to assume gonorrhœa from the presence of urethritis. For the diagnosis it is necessary to establish the presence of gonococci in the urethral discharge. Urethral discharge may be due also to: (1) Other micro-organisms, such as b. coli, staphylococci, streptococci, tubercle,

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diphtheroid bacilli etc., which may commence the discharge, *or keep it up after the gonococcus has disappeared.* (2) Stricture of the urethra (3) Injection of chemicals often in the hope of preventing gonorrhœa, and often too after the gonorrhœa has been cured (4) Occasionally from rheumatism and gout (5) The ingestion of certain articles of diet, amongst which have been reported cress asparagus and strawberries and of certain drugs such as cantharides (6) Excessive coitus (7) Spermatorrhœa or prostatorrhœa and (8) Irritation by foreign bodies in the urethra, such as calculi

(*c*) Many cases of meatal chancre are diagnosed gonorrhœa To avoid this error it is necessary only to note that the discharge in meatal chancre is not thick and purulent there is a characteristic areola round a meatal chancre if it shows and it is generally crusted and there is usually a characteristic induration of the fossa navicularis (see p 50)

It is not sufficient, however to diagnose the mere fact of gonorrhœa. The extent of the disease, whether it affects the anterior urethra, or both anterior and posterior and the existence of complications due to extension of the disease to adjoining structures must also be ascertained if the disease is to be treated intelligently

The most important means of ascertaining the extent of the disease in acute cases and one which must be applied regularly at all stages of it, is the **examination of the urine.** Many systems of urine examination in gonorrhœa have been worked out from time to time Some of them are simple and rather inaccurate, such as Thompson s two-glass test, and others are so elaborate that they are impracticable for routine work outside clinics The following is a method which is simple enough and affords sufficient information

(1) After taking a specimen of the urethral discharge for microscopical examination as described on p 240 wash out the anterior urethra with saline solution using

an irrigator with a two-way nozzle as described on p. 305 collect the washings in one or more glasses and cease the irrigation only when the solution returns free from threads or turbidity

(2) Make the patient pass all his urine into three urine glasses Examine these for turbidity and threads, after adding a little acetic acid to make sure that any turbidity present is not due to phosphates. Note the character of any threads which may be present and make specimens for microscopical examination (p. *41)

(3) If the patient has passed the acute stage fill the bladder with the same clear solution as was used for the irrigation of the anterior urethra (p. 307), and then examine the prostate and seminal vesicles After noting the fact of any abnormality in it (p 35) massage the prostate, etc., catching any fluid which may be expelled from the meatus in a watch glass and then make the patient pass the clear solution from his bladder into a urine glass. Note the presence of threads, etc. and make microscopical specimens

(4) It may be advisable at a later sitting to investigate the condition of Cowper's glands For this purpose wash out the anterior urethra, and then with a finger in the rectum pressing forward below the prostate and a thumb on one side of the perineal raphe, squeeze the structures between the finger and thumb taking care not to press on the prostate Wash out the anterior urethra again into urine glasses and note the presence of any threads or pus Incidentally during this examination any enlargement of the glands will be noted since they are scarcely palpable when normal.

The interpretation of the results of such an examination as that above is simple Any pus or threads found in the first washings indicate anterior urethritis Turbidity or threads in the urine after clearing with the acetic acid, indicates disease of the posterior urethra and possibly the bladder If the urine passed is the first of the day all

diphtheroid bacilli etc. which may commence the discharge, *or keep it up after the gonococcus has disappeared.* (2) Stricture of the urethra (3) Injection of chemicals often in the hope of preventing gonorrhœa and often too after the gonorrhœa has been cured (4) Occasionally from rheumatism and gout (5) The ingestion of certain articles of diet, amongst which have been *reported* cress asparagus and strawberries and of certain drugs such as cantharides (6) Excessive coitus (7) Spermatorrhœa or prostatorrhœa and (8) Irritation by foreign bodies in the urethra such as calculi

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or more obstructions before it reaches the triangular ligament. The patient may complain of pain as the bougie reaches any of these spots and confirmation of the constriction is afforded by pushing the head of the bougie gently past it and then carefully withdrawing As the

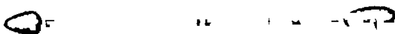


FIG. 6. Acorn-tipped bougie.

bougie is withdrawn its shoulder hitches against th back of the obstruction A bougie which will pass the normally narrowest part of the urethra, i.e the meatus should not be brought up by any obstruction short of the triangular ligament, excluding at any rate that which it may meet at the neck of the fossa navicularis. At the triangular ligament there is naturally an obstruction which may require some ingenuity to overcome. If the penis is put well on the stretch and the patient encouraged to take deep breaths, the bougie usually passes easily into the posterior urethra. If this fails, a little anæsthetic may be injected such as 5 per cent eucaine lactate, novocaine, or stovaine which is allowed to act for a few minutes. Or a large-size curved metal bougie may be passed and then the acorn-tipped. In the posterior urethra, inflammation of the verumontanum is indicated by tenderness as the bougie head passes over it The bougie usually enters the bladder with a little jerk as it overcomes the obstruction offered by the verumontanum. Impressions gathered during the inward passage of the bougie are confirmed and extended as it is withdrawn Naturally the bougie must be handled lightly and one passes and repasses the same spot once or twice to corroborate the impression communicated by any abnormality With experience it is possible to diagnose the density of any obstruction which is felt with the acorn-tipped bougie as it varies from the softer rather rough feel of the recent

the specimens may be turbid and contain threads without the bladder being necessarily affected since the secretions of the posterior urethra tend to mix during the night with the bladder urine If however it is urine which has been in the bladder for only a few hours posterior urethritis alone will be indicated by turbidity or threads in the first and possibly the second urine glasses, but not or only to a small extent, in the third If all three glasses show turbidity or threads then the chances are in favour of some cystitis

As a rule the urine is turbid in the early acuter stages and clears as the disease declines. A light haze however may indicate only a superficial catarrh, comparatively late and if there are no threads it is of much less moment than quite clear urine with heavy threads The naked eye examination of the threads in the urine may give some information as to the nature of the disease and the structures affected They may be divided broadly into light and heavy Light threads are often long and semi transparent They float easily in the urine are mucous in character and indicate superficial irritation of the urethra Heavy threads are dense white and sink at once. Long irregular ones usually come from the surface Thick short crescentic threads, like comma stops, are believed to be plugs of prostatic duct orifices while lighter and more slender ones of the same shape signify disease of Littré s glands They are found only in the first washing as the Littré s glands of the anterior urethra are those which are most prone to be infected

In addition to the above examination it is necessary in the chronic stage of gonorrhœa to explore the urethra for any patches of infiltration The best instrument for this purpose is a gum-elastic, acorn tipped bougie (fig 8) with a stem which is graduated for preference. These bougies are made in various sizes and the largest which will pass through the urethra is found by trial As this passes along the urethra it may be found to hitch against one

gland may be inflamed and taken for a peri-urethral abscess (fig. 9). With a little care the connection between the hard swelling and the minute opening to one side of the frenum can usually be made out.

Various swellings may be found on palpating the urethra



Fig. 10 Peri-urethral abscess in gonorrhœa. (From photo kindly lent by Captain A. M. Davidson R.A.M.C.)

during both the acute and chronic stage (fig. 10). They are spherical and vary in size from a grape seed to a small orange. The commonest ones are about the size of a pea, and in my experience have been found most often about 1 inch behind the meatus, though they often

patch of infiltration to the denser harder and more gristly one of the fibrous stricture

With regard to *local complications* the meatus and its neighbourhood should always be examined carefully in gonorrhœa. Besides the normal meatus there may be

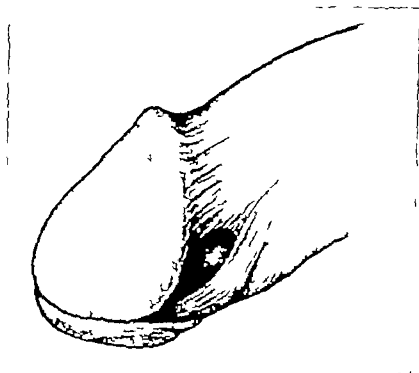


FIG 9. Inflammation of Tyson s gland. (From a painting kindly supplied by Captain L. H. Davidson.)

other openings here such as para urethral canals which are generally above the meatus and may communicate with the interior of the urethra, some distance down it. They are often responsible for persistence of a urethral discharge On both sides of the frenum are the openings of Tyson s ducts either of which with its corresponding

gland, may be inflamed and taken for a peri-urethral abscess (fig 9). With a little care the connection between the hard swelling and the minute opening to one side of the frenum can usually be made out

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also occur half way along the pendulous portion and practically anywhere in the course of the anterior urethra. The urethra should always be palpated for these swellings at regular intervals throughout the course of the attack, since they often explain intractability and relapses In fact, if a patient is dismissed treatment with one or more such swellings unresolved even though he may be clear of discharge and urine threads he is a likely candidate for relapse In the chronic stage of the disease or after the urine has become clear the palpation should always be assisted by the passage of a straight metal sound along the anterior urethra. The urethra can be palpated much more easily on the surface of the sound and minute swellings detected which would be missed without it

Cowperitis may be indicated by an abscess pointing in the perineum or may be detected only on special examination It should be distinguished from prostatitis with which it is sometimes confused Usually the patient complains of acute pain in the perineum especially at the end of micturition when the contracting compressor urethræ squeezes the inflamed gland The gland can be palpated by inserting a finger in the rectum and hooking it forward to the apex of the prostate Then with a thumb on the outside of the raphe and just behind the bulb, finger and thumb are approximated The patient will usually complain of acute pain when an inflamed gland is squeezed and the palpating digits may feel a swelling about the size of a large pea Prostatitis is excluded by absence of tenderness when the region of Cowper s glands is carefully avoided and the prostate alone palpated In some cases infection of Cowper s glands may be detected only by examinations of washings from the anterior urethra after massage of the gland as mentioned above under Urine Tests. A careful examination should always be made for stricture in acute Cowperitis since it is common in such cases and has very

possibly some ætiological connection with this complication

The prostate and seminal vesicles are commonly involved in gonorrhœa, and their condition should always be the subject of investigation when there are indications from the appearance of the urine, that the posterior urethra is infected. It is common also to find prostatic and vesicular disease and their treatment is important in all metastatic complications such as arthritis iritis etc

The first indication of prostatic involvement may be the occurrence of an **acute prostatic abscess** with the following symptoms. During the course of an acute attack of gonorrhœa the patient complains of pain in the lower rectum and perineum, which is especially severe on defæcation. Strangury and frequency occur or without these there is often retention of urine. Acute retention of urine occurring in acute gonorrhœa is in fact, almost pathognomonic of prostatic abscess Examination per rectum, which must be very gentle reveals an enlarged acutely tender prostate After a few days of severe pain in this form, the patient is relieved, and there is simultaneously a large increase in the discharge from the urethra or the urine is more heavily loaded with pus The indications are clear that the prostatic abscess has burst into the prostatic urethra. Very rarely a prostatic abscess bursts into the rectum or into the cellular tissue around the prostate.

Much more common than acute prostatitis is the chronic or subacute form, with enlargement and retention of inflammatory secretion within the ducts and glands. It may co-exist with disease of one or both seminal vesicles, and the existence of both these complications is detected by examination per rectum. The patient may adopt the knee-elbow position on a table or stand with his trousers off and his left foot on a chair seat or rung while he grasps the back of a chair and leans well over his bent thigh. The gloved right forefinger is introduced

into the rectum and feels for the prostate while the left hand in front presses towards it from over the pubis The limits of the prostate are first defined and any difference in size between one lobe and the other is noted as well as the presence of soft tender spots which feel to the finger as if it were passing over holes in a piece of solid rubber covered with a smooth cloth. Above and towards the lateral margins of the prostate, one feels with the lateral margins of the finger for the blind ends of the seminal vesicles Normal vesicles can scarcely be made out and if one or other is easily palpable it is highly suggestive of disease especially when the vesicle is also tender Sometimes seminal vesicles feel as if they were filled with plaster of paris but this is rare To the inner side of each vesicle the lower end of the vas or ductus deferens may feel enlarged and be tender to palpation

Examination of **dorsal lymphatics** *often reveals* their enlargement in acute gonorrhœa and there may especially be a swelling almost at their commencement in the middle of the dorsum of the prepuce This swelling may be rather hard and rubbery and simulate a buried syphilitic *induration It is distinguished from the latter by* being not so cartilaginous and button like but more doughy Swelling of the prepuce also points to lymphatic obstruction

Cystitis, if purely gonococcal is hardly distinguishable *from acute posterior urethritis* as it affects only the neck of the bladder If the symptoms are those of acute *general* cystitis one should always suspect an active mixed infection The same applies to symptoms of **pyelo-nephritis**, although cases of purely gonococcal cystitis and of pyelitis have occasionally been described

Besides the above diagnostic features of gonorrhœa and its complications, a *few others* require mention as they concern the important question of cure.

A patient who has at one time suffered from gonorrhœa may wish to be sure he is free from infection before

marriage or for some other reason. The following tests should clear up the question.

(1) Examination in the manner described above under diagnosis, especially after the patient has drunk beer or stout for a few days. The microscope should reveal no gonococci in the specimens of discharge or urine. If pus cells are found, one should be very cautious about the clean bill of health. In connection with the examination of urinary deposit, it should be remembered that gonococci autolyse and disappear in alkaline urine. The urine should therefore not be allowed to stand before being spun out and the deposit collected.

(2) Cultivation of the centrifugalised deposit from the urine obtained as described on p. 300.

(3) Microscopical examination of the urethral secretion provoked by such an irritant injection as 5 per cent. protargol.

(4) When the urethra is perfectly quiet the hypodermic injection of a fairly large dose of vaccine, say 150 to 200 millions, will often provoke in a gonococcus carrier a general reaction in the form of a rise of temperature, and a focal reaction in the form of a urethral discharge, in which gonococci may be found.

(5) The blood may be tested with a gonococcus antigen for complement fixation. It is a test which is not greatly practised in this country but one which I believe from experience to be valuable. Captain D. Thomson, working in the Rochester Row Laboratory, has greatly improved its technique and in contrast to the experience recorded in the literature frequently obtains positive reactions in uncomplicated cases of a few days' duration. It is of practical significance that after the injection of a dose of vaccine the blood serum of a gonococcus carrier will increase much more rapidly in positiveness to the complement fixation test than that of a normal person.

CHAPTER IV

LESIONS OF THE PENIS (*contd.*)—SYPHILITIC AND NON SYPHILITIC SORES AND EROSIONS—PAPILLOMATA

Venereal sores which may be found on the penis are of all varieties of appearance, but for practical purposes may be divided into syphilitic and others, since the latter are of only local importance.

The chief question which arises in the mind on seeing a venereal sore is whether or not it is syphilitic, and if syphilitic, whether it is a primary sore or a later lesion.

There is usually little difficulty in deciding between a later syphilitic lesion and a non syphilitic, and the points of distinction may safely be left until the different sections of the penis are discussed in detail. But there is often confusion between primary syphilitic sores and those non syphilitic which are called soft chancres. Observation of the following general principles will assist the diagnosis.

Attention should always be directed to the edge of the erosion or ulcer its contour its base, and the character and extent of any induration which may be present, as well as the microscopical examination of the exudate from its margin.

A primary chancre contrasts with a soft chancre in the following respects (Plates I III and figs. 11 and 13). *The edge* of the primary chancre slopes gently towards the ulcerated or eroded part within and the normal without that of the soft chancre is sharp and undermined on its inner side, and often rises very abruptly from the normal tissue without. In a primary syphilitic sore, if the part

adjoining the ulcerated or eroded portion is examined there will usually be seen a definite, pinkish-red band or areola around the erosion, as if the latter had been painted round with a brush. The band may vary in width and be very narrow but it is a band and not a line, and at its outer edge its colour contrasts sharply with that of the normal looking tissue beyond. The edge of a soft chancre, on the other hand, may show a bright red line, but that is all, and beyond the very edge of the ulcer the tissues appear normal. The contour of a primary chancre is always evenly round or oval that of a soft chancre may also be even, but more often shows salients thrust out into the surrounding tissue.

The base of a primary chancre is often built up so that it is level with or overtops the edge that of a soft chancre is usually sunk a millimetre or so below the edge, and is pitted or worm eaten in appearance. If any part of a soft chancre is higher than the edge, as sometimes happens, it is usually still possible to run a probe under the edge.

A primary chancre becomes fairly quickly matted together with a band of induration, which extends a variable distance outwards, under the normal surface beyond the ulcerated portion. The effect of this is that, if one places a finger well beyond one edge of the sore and a thumb well beyond the opposite, and then slowly approximates finger and thumb, whilst pressing gently on the surface, long before the ulcer is reached the finger and thumb impinge on a rampart of induration, with which the whole lesion is matted together The feeling is somewhat as if there were a disc of indiarubber in the tissues.

A soft chancre may also feel hard when old and healing but the hardness is confined to the ulcer itself it does not extend into the tissues beyond. A syphilitic chancre tends to ooze serum rather than blood, while a soft chancre bleeds much more easily

If a sore is painless, the probability is that it is syphilitic.

If painful it is more often of the nature of soft chancre, but may easily be syphilitic. If a sore is single, it is probably syphilitic if multiple, it may be either

Lastly the serum from a syphilitic chancre contains the spirochæta pallida.

Microscopical examination of the serum from a sore should never be omitted since even in cases where the appearances have been perfectly typical of primary syphilis it provides a piece of evidence which may be of the greatest value later when remembrance of the clinical appearance has faded from the mind When the spirochæta pallida is not found the examination should be repeated at intervals for some weeks since many lesions of the penis which are not syphilitic at first may take on syphilitic characteristics later these may be disguised by the appearances of the original lesion and the microscope will give information as to the added infection long before the naked eye can do so Further in the very earliest stages of primary syphilitic sore that is when the public should be educated to seek for advice one cannot be certain of its syphilitic nature from the naked-eye examination but the microscope will reveal the fact in a few minutes I can speak with some experience in this matter By frequent demonstration of the powers of the microscope as a diagnostic agent in the early stages of syphilis and the better results of treatment when commenced then the soldiers in a certain district became gradually educated to report with the slightest spot or abrasion and syphilis was frequently diagnosed with certainty when the sore was little if any bigger than a pin s head when in fact, none but the boldest would have made a diagnosis with confidence from a naked-eye view

The above diagnostic points will be mentioned again with others when the different portions of the penis are considered in more detail If they are kept in mind there should be little difficulty in diagnosis

The prepuce is probably more often the seat of venereal lesions than any other part of the penis Moreover apart from any definite sores which may be seen on it, one can often diagnose by inspection and palpation of a long prepuce the nature of lesions which may be hidden before these are exposed Thus a dull, livid red or bluish tint of

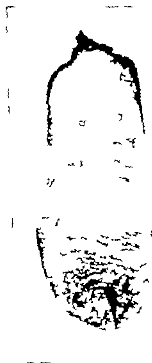


FIG. 11 Syphilitic oedema of prepuce (From photograph kindly lent by Captain W Brown)

the prepuce which is swollen and perhaps rather scaly is particularly characteristic of the presence of a syphilitic sore somewhere near whether it is under the prepuce at it mouth, or on the outside (fig 11). The impression is confirmed by palpation. A syphilitic prepuce feels in

these cases tough and indiarubbery This indurated oedema may affect the skin of the whole penis and spread on to the scrotum but more often it is confined to the prepuce It is distinguished from the oedema which may accompany gonorrhoea or soft chancre by its colour which is duller and more livid and by its toughness a prepuce which is oedematous from these other lesions being much softer

The prepuce may appear quite normal except that a *considerable amount of pus is oozing from its orifice* In these cases when it cannot be retracted sores may be felt under it and if the characteristic rampart like edge is felt as if the ulcer were a hard foreign body under the prepuce it is pretty certain that there is a primary chancre there

There may be a sore which varies in size from a pin s head to a shilling or bigger on the outside of the prepuce, away from its orifice. This may be a soft chancre or a syphilitic The diagnosis is made on general principles. The soft sore shows its characteristic edge which is often irregular with salients thrust out into the surrounding area it rises abruptly from the normal side for about a millimetre and is undermined on the ulcer side The base is usually pitted or may be covered with a diphtheroid membrane The induration of a syphilitic sore may not be very obvious here but the sore is always more matted together and less flexible than a soft chancre would be there is usually the areola at the margin of the syphilitic erosion which is crusted and generally level with the edge The edge does not rise abruptly from the surrounding skin but slopes very gently away into the surrounding parts and its contour is round or oval (Plate I)

The mouth of the prepuce often shows lesions especially when there is more or less phimosis When a patient is phimosed the sexual act frequently causes a number of radiating fissures of the preputial orifice. These may

PLATE I.



Primary chancre of skin of penis.

remain as simple fissures, or become infected with the virus of soft chancre or that of syphilis It is difficult to determine when a fissure has simply become septic or has become a soft chancre unless one makes a microscope examination, since the latter appears merely to be a degree more severe than the other

The distinction is not of any practical importance; the chief point is to determine whether or not the fissure has become syphilitic. In the latter case the edge is thicker and stiffer not soft and œdematous, and the fissure becomes more open and furrow like not with edges in apposition and undermined as in chancroidal fissure but sloping gently down to the floor of the furrow In syphilis, too there is generally a dull-red areola spreading over the edge and into the surrounding tissue. It may be difficult to see these fissures when the phimosis is severe but a shrewd suspicion of syphilis is usually aroused by the appearance of the rounded end of the fissure and the tough stiffened feel of the prepuce on that side.

Apart from fissures, there may be a ring of sores at the very margin of the prepuce which may be of the nature of soft chancre or of primary syphilis The soft chancres are often quite small and circular (Plate II), and the usual types which are seen are (1) a lesion with a small hole in the top of it, through which one can see a yellowish white plug, while a probe passed through the hole can be swept round in a cavity which would take a small pellet and (2) a more open, circular sore the edges of which rise abruptly from the surrounding mucous membrane and are precipitous on their inner side where they lead down to a moat, which may slightly underrun the wall The moat surrounds a mound of granulation tissue which rises in the centre to a greater height, perhaps, than the edge of the ulcer The syphilitic sore is distinguished from both of these by its rounded edge, its areola its slightly indented rather than excavated base,

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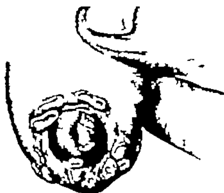
and the indurated feel of the prepuce on that side Sometimes the presence of one or more syphilitic ulcers there causes the orifice of the prepuce to be converted to a cartilaginous ring The small soft chancres which are so common at the mouth of the prepuce often become very hard almost cartilaginous when they have existed for *some time but the induration is confined to the ulcer* itself it does not extend into the surrounding tissues

A crop of **herpes** at the preputial orifice may be mistaken for venereal sores The individual lesions are minute circles and if the top of the vesicle has been removed the underlying lesion is much shallower than a soft chancre The vesicles often occur in little closely-set groups but the outline of each individual component of *the group can be defined*

The mouth of the prepuce may be occupied by a number of **papillomata** (fig 12) which may be scattered or completely surround it In their usual form they are easily diagnosed by being pedunculated and branching not flat and sessile like broad syphilitic condylomata. It is only when they form part of a similar condition affecting the whole end of the penis and producing a cauliflower appearance that they may raise the suspicion of being epitheliomatous In the latter case they can usually be distinguished by the presence of isolated papillomata around by the margin of the growth at its root being sharply cut and by the normal appearance of the tissues immediately surrounding the growth itself which contrasts with the induration accompanying an epithelioma A histological examination would naturally be called for in cases of further doubt

Most sores about the mouth of the prepuce are accompanied by evidence of more or less **balanitis**, or inflammation of the lining of the preputial sac, with a purulent discharge from the mouth of the prepuce which must not be taken at once for gonorrhœa In the absence of the latter it is generally easy by retracting the prepuce

PLATE II



Soft chancres of prepuce and glans penis. Note the abruptly rising undermined, red tipped margin, and the irregular outline of the lesions on the glans.

(From painting kindly lent by Lt.-Col. R. Bolam.)

as far as possible to establish the fact that the discharge does not come from the urethra. Apart from this, a balanitic secretion has a particularly sickly odour. Naturally balanitis may and often does, co-exist with gonorrhœa.



Fig. [illegible].—Venereal warts or papillomata at preputial margin and meatus. (From photograph kindly lent by Captain A. M. Davidson.)

A brownish red, evil-smelling discharge from the mouth of the prepuce should arouse a suspicion of phagedæna, and this would be confirmed by the appearance of a blackish area on the skin of the prepuce about the line where this covers the corona. One should not however wait for the black area to appear but expose the sub-

preputial sore by a dorsal incision if there is the least suspicion of phagedena

So far the prepuce has been considered as seen completely covering the glans Another condition must be mentioned in which the glans is exposed but the attention centres first on the prepuce The latter lies well back in the coronal sulcus and the ventral portion of it is swollen with serous effusion into a semi-translucent pillow around the frenum This is of course a **paraphimosis**. The chief importance of venereal paraphimosis is that it is often very difficult to determine whether any ulceration which may be seen in the portion behind the sulcus is venereal or was produced merely by the mechanical effect of the paraphimosis It is important to determine the question since the original cause may have been a venereal sore which caused phimosis by inflammatory swelling, and the patient's efforts to retract his prepuce or else coitus has resulted in a paraphimosis A careful examination will usually clear up the question fairly quickly

Lesions of the under-surface of the prepuce, glans penis, and frenum *may be obvious from the first, or if the* patient is phimosed it may be necessary to slit up the prepuce by a dorsal incision to expose them

The question as to whether this should be done in any given case naturally depends on circumstances As mentioned in many cases one can gather a pretty shrewd idea of what is hidden below it by palpating the prepuce and examining the discharge It may be apparent that, with a few days treatment the phimosis will have subsided sufficiently to allow of the prepuce being retracted and in this case one might wait On the other hand *if there is any suspicion that there is a severely* septic process going on under the prepuce, such as phagedena, or if it is obvious that a satisfactory view cannot be obtained quickly it is better to slit up the prepuce without any delay This can be done under local anæsthesia (p 343)

The venereal lesions which are found on retracting the prepuce are: syphilitic and soft chancres later syphilitic lesions; balanitis or balano-posthitis papillomata and gonorrhoea. The last-named has already been described

Syphilitic chancres are found on the under-surface of the prepuce in the coronary sulcus on the glans penis and on the frenum. They have the same general characters as have been described but differ in detail according to their situation. On the under-surface of the prepuce the primary sore appears as a rounded slightly raised greyish-white plaque surrounded by a pinkish red areola or as an ulcer of varying size with a dull red shining base, which may be covered with a greyish necrotic membrane The edge is thickened slopes gradually away on either side, and is red and shining while the surrounding induration is usually well marked especially when the sore is palpated from the outer surface of the prepuce

On the other hand there may be no particular erosion and the only evidence of the lesion is a cartilage-like button under the intact mucous membrane If the ulcer is situated close to the preputial fold retraction of the prepuce produces a perfectly characteristic appearance: the whole lesion flicks over like a plate turning on its edge On healing, the tissues about the original sore may remain for many weeks matted together into a tough wrinkled mass

Primary syphilitic sores in the coronal sulcus are perhaps the most characteristic of all sores. The floor of the sulcus is occupied by an ulcer which may be only a few millimetres in length or occupy the greater part of the furrow Around the ulcer there is a rounded rampart of indurated tissue which extends farther and is more marked on the preputial side than that of the glans the induration of the latter progressing little beyond the corona (Plate III). At first the indurated portion is dull red but later becomes whitish like cartilage seen through

the mucous membrane with splashes of pinkish red in it. When only a few millimetres of the sulcus are affected the indurated tissue surrounds it in the form of two cres cents or sickles the ends of which touch in the sulcus giving the characteristic swallow s nest appearance. When the sulcus is involved to a greater extent the whole of it is bordered by the rampart of indurated tissue, which is thicker and more plate-like on the preputial side When the prepuce is retracted the sore springs suddenly into view in the characteristic manner men tioned above

The induration persists for a very long time after the sore has healed Even many years later a white crescent which is as hard as cartilage may mark the site of the primary sore and the spirochæta pallida has been demon strated in such plates of induration by Mills and others In later years this chancre, like others may reawaken and appear as an indurated mass with little or no ulcer ation

The original sore may also in later years be the seat of gummatous ulceration becoming then superficially like a primary sore **Ulcerating gumma** is distinguished from primary sore, however by being deeper with a sharply-cut, punched-out edge, with crater like, steeply shelving walls and a tough yellow wash leather like slough at the bottom

Primary syphilitic sore of the **surface of the glans** is usually recognised easily although the surrounding indura tion is not so obvious as in most other situations It commences as a pinkish red flat spot, which grows until it reaches the size of a threepenny bit, when it shows in its centre a small yellowish patch of superficial necrosis which is flush with the surface not below it as in soft chancre By this time the lesion is circular dull red and shining from the serum which bathes its whole surface Extension of the central necrosis produces a shallow sore covered with a dirty-grey crust and with slightly

PLATE III.



Primary chancre occupying coronal sulcus

rolled edges, round which the characteristic, shining red areola can be seen. It contrasts with soft chancre in this region (Plate II and fig 13) in the regularity of its outline and the absence of marked tissue destruction.

At the frenum the appearance depends much on whether

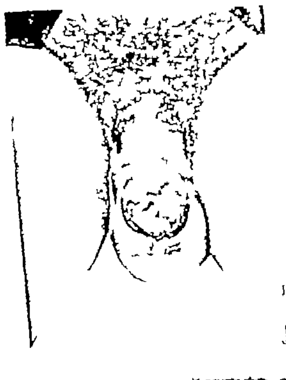


Fig [illegible] [illegible] of [illegible] hancre of glans penis (From [illegible] photograph kindly lent by [illegible] ptain A M [illegible]) Illustrates the destruction of tissue, and the irreg[illegible] of outline of the original chancroid.

th[illegible] [illegible] broken or not If unbroken the [illegible]philitic [illegible] the frenum into a thick, dull r[illegible] [illegible]d which [illegible] [illegible]urat[illegible]d in the characteristic manner When the fren[illegible] [illegible] broken an oval, indented sore [illegible] with dull red areola around it, and the indura

tion extends under the normal tissues beyond for some millimetres The indiarubbery induration of the adjoining portion of prepuce often gives the clue to the syphilitic nature of a sore at the frenum.

Syphilitic chancres of **the meatus and fossa navicularis** may involve the whole orifice or only one lip of it The chancre may be concealed from casual view by being situated entirely within the fossa or a varying amount of it spreads over the edge of the meatus so that some of it can be seen at the tip of the penis

In its earliest form the sore which appears outside is a dull-red shining erosion which spreads for a few millimetres from the margin of the meatus in a circular manner or as the arc of a circle Older sores show a dirty white, necrotic covering in their centre but the well-defined red shining areola is always obvious and characteristic. The erosion should not be mistaken for the excoriation which often accompanies gonorrhœa. The latter is uniform around the meatus while the syphilitic is very often unilateral Even if a syphilitic sore does surround the meatus it is easily recognised by its areola and by the stiff indiarubbery feel of the tissues there which is not found in either gonorrhœa or soft chancre When the sore is unilateral the induration spreads down one side of the fossa in a very characteristic manner as pointed out by Mr C H. Mills If the glans is grasped just behind the meatus with a finger and thumb laid *at right angles to the long axis of the penis* and the fossa navicularis squeezed from above down as if to open out its lips the induration is felt *on one side only of the fossa* like a plate of rubber or a flat foreign body which can be rocked about on either edge This plate of induration contrasts very markedly with the soft pliable feel of the opposite wall of the fossa When no sore can be seen outside palpation of the fossa in this manner will often discover a syphilitic sore within This sign serves also *inter alia* to distinguish a syphilitic sore from a soft chancre which

may be seen on opening out the lips of the meatus. The lips and both walls of the fossa remain quite pliable when the sore is a soft chancre

If the fossa navicularis were always palpated in the manner described above, it would be found that syphilitic chancres are very much commoner there than is generally supposed They are very frequently diagnosed as gonorrhœa until a rash appears, and even then the observer often fails to find the sore Since a secondary rash is not invariable, it is conceivable that many of the tertiary cases we see, who give a history only of gonorrhœa, were originally instances of chancre of the fossa.

In later stages of syphilis than the primary lesions occur under the prepuce, which are very similar to those found in other parts of the body at the same time. The chief of these are syphilitic macules and papules Macules on the glans are noteworthy as, though often overlooked they frequently show up more clearly than those of the skin They appear as small, round dark-red spots, the diameter of a split pea, or bigger and it is very easy to obtain the spirochæta pallida from them. Papules are more prominent and less easily overlooked than macules. They are elevated spots, possibly covered with a white layer of macerated epithelium the removal of which discloses the dull-red shining papule below Papules may be very prominent, especially near the site of the original sore and by extension of their area they may become flat warts (broad condylomata) similar to those found so commonly between the buttocks at the same period They can usually be distinguished from primary lesions and from soft chancres by the absence of definite ulceration removal of the macerated covering revealing intact the broad red shining papule below

The papular syphilide may as in other situations be annular in type, a ring of slightly raised red indurated tissue surrounding an area which is normal in appearance, or lightly brownish-red.

Gummatous ulceration has been mentioned already in connection with the later changes to which primary syphilitic scars are subject It may occur apart from the original primary scar but the appearances and diagnostic features are practically the same as those already mentioned

Leucoplakia of the glans should be mentioned here. Although it may occur apart from syphilis, it is so frequently associated with a syphilitic history that its presence should stimulate a close investigation with syphilis in view The covering of the glans is wholly or partially thickened and raised into a tough, bluish white, furrowed, rope-like mat, while other parts of the glans are red and shiny in patches, as if denuded of epithelium.

Soft chancre of the parts covered by the prepuce shows the characters already described though perhaps in a more pronounced form The sharply cut, finely notched bright, angry red undermined margin the base which is greyish white, worm eaten and pitted, or covered with a smooth, yellowish-white diphtheroid membrane and the absence of induration and matting of the tissues around serve to distinguish it from the syphilitic sore. When taken up by its edges, it buckles comparatively easily and it bleeds much more freely than a syphilitic sore. Soft chancre tends, especially on the glans, to spread more deeply than the primary syphilitic sore, and without great extension of its borders may bore so deeply as to open into the urethra. On healing it often produces considerable deformity of the glans.

Soft chancre is almost always multiple, and it shows this characteristic in the parts below the prepuce more markedly than in other situations probably because the circumstances there favour spread of the infection to other spots so much better It is common to find one or two large sores and a number of small ones from the size of a pin-head upwards. The small circular forms already mentioned in connection with the mouth of the prepuce

are often seen on the glans and have much the same characteristics.

A septic, non-syphilitic sore often occurs just *inside the meatus*. It exists there generally as a small, shallow punched-out ulcer with a smooth whitish-yellow base and irregular edges tipped with red. It is easily distinguished from a syphilitic sore by its punched-out appearance and absence of any signs of induration of the wall of the fossa.

At the frenum, the ulcer generally perforates. It may be planted on each end of the broken frenum, or the whole area formerly covered by the frenum may be occupied with a characteristic ulcer.

On both sides of the frenum are the orifices of Tyson's glands, which may be infected with ordinary septic micro-organisms, producing an inflammatory condition which may have the characters of soft chancre.

Either type of sore, syphilitic or soft chancre, may become *phagedenic*. The ulcer becomes covered with a blackish, crumbling slough, exudes an evil-smelling brownish-red discharge, spreads rapidly at its edges, and may perforate the prepuce or eat deeply into the glans, even opening up the urethra. Most of the glans may in fact, be destroyed in a very short time. Evidence of its appearance on the outside of the prepuce is shown by a black spot, which very quickly spreads, gives way and discloses an opening into the preputial sac.

Balanitis or balano-posthitis (Plate IV) may or may not be venereal in origin. It is usually associated with phimosis, and may exist alone, but also very frequently accompanies venereal lesions here. It consists in a superficial inflammation of the glans and lining of the preputial sac. The mucous membrane becomes reddened and its folds thickened, so that they look *stiff and infiltrated* though remaining soft and doughy to touch. The superficial epithelium becomes macerated, and, *being shed* extensively, leaves a very red surface in which are islands

of white. The red portion shows rather prominent papillæ which are tender to touch There is always considerable effusion of sickly smelling whitish yellow discharge. The condition is easily distinguished from syphilis by the absence of definite ulceration and induration, by the brighter red appearance of the denuded areas, and the fact that it affects the whole membrane.

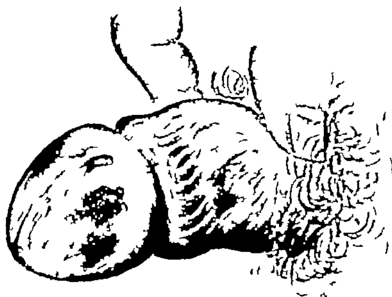
The existence of balanitis should however always stimulate a search for associated lesions which may easily be overlooked Many cases of syphilis are originally diagnosed balanitis from failure to examine carefully every part of the preputial sac, glans and frenum.

Papillomata may be found in the coronal sulcus at the entrance to the meatus, or elsewhere, and may be limited to a few discrete warts, or much more rarely cover the whole glans and lining of the prepuce. They do not differ from the same lesions already mentioned in connection with the mouth of the prepuce, and usually cause no difficulty in diagnosis unless they bury the whole end of the penis in a cauliflower like growth and raise the suspicion of being carcinomatous. The points of distinction have already been mentioned.

Herpes, as also itch burrows, are often mistaken for venereal lesions. Herpes especially because, although it is not a syphilitic lesion, it very frequently occurs on the penis in syphilitic subjects, and the history naturally leads to a suspicion that this is a recurrence.

Herpes is manifested by the appearance of crops of tiny vesicles about the size of a pin head which are often closely set in little clusters. Owing to the maceration and friction to which they are subjected beneath the prepuce, they frequently form shallow little ulcers. They are easily recognised by the very shallow nature of the individual ulcer the base of which is not pitted as in soft chancre, nor indurated as in syphilis. When a group of these little spots coalesces, to form a larger lesion, the margin is made up of the segments of many little circles

PLATE IV



Balanitis, showing thickening of preputial mucous membrane

which give it a typical appearance. Another characteristic is the manner in which crops of herpes appear and disappear generally preceded or accompanied by itching or neuralgia of the affected parts.

Itch burrows may be found on the glans and are easy to distinguish by the entrance at one end, which is usually covered with a small scale, and the burrow which can be seen under running the surface, raising it into a narrow ridge or a mound of normal-coloured mucous membrane. Burrows may extend under the mucous membrane of the glans for an inch or more.

Lesions of the Skin of the Penis.—Syphilitic sores are primary chancres and lesions similar to those which are found in other parts of the body during the later stages of syphilis.

Primary syphilitic sores are similar in their main features to those found on the skin of the prepuce (Plate I) The sore appears at first as a dull-red papule which ulcerates or erodes, and by the time the patient usually appears for advice there is a round or oval ulcer which is about the size of a sixpence, or larger Its margins are slightly raised above the surrounding skin, thickened, and not undermined. The base of the sore is covered with a dirty-grey or brown crust which may fill it up to the level of the raised margin. When the crust is cast off or removed, the base is found to be covered with dull red granulations, which often become prominent and project above the level of the margin. The ulcer may be very tender especially when situated at the peno-scrotal angle, where also it is often mouster

Soft chancres of the skin of the penis resemble in their diagnostic features similar lesions on other parts of the penis. The ulcer may become serpiginous, maintaining the above characters but healing at one edge while advancing at the other In this way it may advance over the penis and inguinal region, leaving behind it a scarred track and lasting for several months. It is distinguished

from the tubero-serpiginous syphilide (which is rarely seen here and will be mentioned later in connection with the trunk) by the absence of any nodular infiltration of the advancing border

The dorsal lymphatics are often quite palpable during the primary stage of syphilis, the lymphatics feeling knotty at the distal end and towards the root, like a narrow flat leather lace under the skin. The knots correspond to the infiltrated valves of the lymphatics.

Primary syphilitic sores of the skin of the penis are like those beneath the prepuce, often accompanied by the **indurated œdema** of the prepuce, etc. described on p. 41.

Later syphilitic lesions of the skin of the penis are similar to those found on other parts of the body and a description of the characters of most of them may more conveniently be postponed until these parts are considered.

The small papular lichenoid syphilide, a secondary lesion, is characterised by groups of small pin-head yellowish brown, round papules, many of which are capped with a small white scale which occupies the summit of the papule. They may be confused with the spots of lichen ruber planus, especially when these are confined to the penis, as sometimes happens. They are distinguished from lichen by the individual spots being round not polygonal, and by the character of the scale, which is less adherent to a syphilitic papule and does not give *it the polished, waxy appearance of lichen.* When the syphilitic scale is removed the spot below is yellowish *brown, while the ground tone of lichen is purplish.* Lichen usually itches and similar spots are generally found elsewhere, although as said, they may be confined to the penis. The syphilitic lesion is usually associated with other manifestations of syphilis elsewhere, and the spirochæta pallida can be found in the exudate from it. A positive Wassermann reaction does not necessarily prove the syphilitic nature of the lesion in question, but a negative reaction should help a diagnosis of lichen since

syphilitic papules occur in a stage of syphilis, where, in the absence of previous treatment, the Wassermann reaction is almost always positive.

Herpes may occur on the skin of the penis, but is distinguished from syphilitic lesions by the characters already mentioned (p. 84).

Syphilitic and other venereal lesions are easily distinguished from those of molluscum contagiosum, which favour the genitals. The pearly white, hemispherical molluscum lesions, varying in size from a hempseed to a split pea, each with its umbilicated centre out of which the molluscum bodies can be expressed, are like nothing syphilitic, even when they become confluent to form a raised lesion the size of a sixpence or bigger. In the latter case a little depression marks each of the separate molluscum spots of which the composite lesion is made up.

Itch burrows are easily recognised in the simple form when they have not been scratched unduly. There is a small globular swelling which contrasts with the syphilitic papule in being covered with normal, not reddened, skin. There is usually also, evidence of itch in other parts and if it happens that syphilis does co-exist, there are always the other syphilitic lesions for comparison. When excessively scratched, an itch-infected penis may appear covered with bloody crusts, but these are linear not circular as in syphilis, and no definite ulceration is disclosed when the crusts are removed, unless the roof of the burrow has been torn off.

Gumma of the skin of the penis forms first as a swelling which soon implicates the skin, and, breaking down in the centre, causes an ulcer which is easily distinguished from primary syphilitic sore or from soft chancre. The ulcer is deeper with even, sharply-cut, undermined edges which are thicker than the notched irregular edges of soft chancre. The floor of the tertiary syphilitic ulcer is usually occupied by the classical tough, whitish yellow or wash-leather slough.

CHAPTER V

THE SCROTUM AND ITS CONTENTS THE INGUINAL REGION ANUS AND RECTUM

Lesions of the Skin of the Scrotum.—Primary syphilitic sores are found fairly frequently in front of the scrotum, and often at the point of contact of similar sores on the under surface of the penis A chancre at the peno-scrotal angle naturally affects both penis and scrotum, and, being at a point where it is liable to stretching and friction, is deeper and more painful than most syphilitic sores in these parts. Otherwise, the primary sore of the scrotum has the same essential features as a similar sore on the skin of the penis. It may be confused with a broad syphilitic condyloma, but the latter is more raised lighter in colour and much more often multiple it affects the side of the scrotum rather than the front, and is not ulcerated or eroded in the centre like a chancre.

Secondary lesions are common, especially in cases where the patient has delayed seeking advice for three or four months from the commencement. They affect more particularly the sides and back of the scrotum, and there are two main varieties, both of them papular in nature. Their peculiarities really depend on the amount of friction and maceration to which they are subjected.

The annular type of **moist papule** occurs on both front and back, but is seen at its best when the scrotum is pulled back between the thighs and spread out so as to put it on the stretch. It occurs as a raised circular ridge about a millimetre broad, enclosing a circle about the size of a

threepenny bit, which appears normal or is brownish-red. The ridge itself is pinkish-red and raised about half a millimetre above the surrounding skin. It is often covered with a very light scale, and serum oozes freely from it, especially when the scrotum is put on the stretch, or the part is very lightly scraped. At a later stage the lesion is lighter than the surrounding tissues, and when the scrotal skin is stretched out, the slightly glistening white ring raised above the surrounding skin is pathognomonic of syphilis.

Broad condylomata are commonly found at the angles



Fig. 14. Pemphigus vegetans. The initial lesion commenced on the penis, and the condition of the scrotum and inner sides of the thighs led [illegible] diagnosis of syphilis. The lesions on the legs commenced later as bullæ and eventually spread all over the body. No spirochætes were ever found, and the Wassermann reaction was continuously negative. The patient eventually died.

between scrotum and penis, and scrotum and thigh. They often extend along the contiguous surfaces of thigh and scrotum, where the parts are kept in a state of continual

friction and moisture, and may here run together into broad plaques. They are flat, sessile, warty outgrowths, raised a millimetre or so above the surrounding surface, and generally dome-shaped or with very slightly depressed tops (see figs. 42 and 43, p 211) They are moist and shining and their covering of macerated epithelium gives them a greyish white appearance, which contrasts with that of the surrounding skin. They are easily distinguished from ordinary papillomata by their broad base and by the absence of branching Sp. pallida swarms in the serum from both these types of syphilide, and they are very contagious lesions.

Condylomata may be confused with the similar looking outgrowths of **pemphigus vegetans** when these affect the scrotum, as shown in fig 14 This mistake was made more than once in the case illustrated before bullæ appeared all over the body The best points of distinction are the absence of the Sp. pallida from the lesions, and the appearance of the bullæ, which are unlike those of syphilis. The Wassermann reaction may be negative, and anti syphilitic treatment has no effect on pemphigus.

Contents of the Scrotum.—The changes produced by venereal diseases which are found on palpation of the contents of the scrotum are those of the urethra, testicle, epididymis, and (generally associated with one or other of these affections) of the cord and tunica vaginalis. Excluding peri urethral abscess gonococcal lesions commonly affect the epididymis exclusively and syphilitic, the testicle. In either case however the process may extend from one to the other and exceptionally syphilis may affect only the epididymis.

Occasionally a *peri urethral abscess* may be discovered on palpating the urethra through the scrotum. Such abscesses sometimes attain the size of a tangerine orange.

Gonorrhœal epididymitis is the commonest of all disorders found within the scrotum. It is usually associated with very manifest and easily diagnosed gonorrhœa,

although cases frequently occur in which gonorrhœa is denied, and the signs of it may be difficult to discover The epididymis is swollen, painful, and tender to touch, and stands out prominently from the back of the testicle, which is often, itself, inflamed. The swelling and pain vary in degree from mild, with just obvious enlargement and feeling of discomfort, to very great enlargement, with exquisite pain and tenderness, and often then considerable redness and œdema of the scrotum. In its severe degrees it is usually associated with acute hydrocele of the tunica vaginalis, which may hide the enlargement of the epididymis from the palpating finger In these cases the acute tenderness behind and below usually gives a strong clue to the nature of the disease, apart from the associated urethritis. The cord is affected in a certain proportion of cases, being thickened and possibly painful, especially at the internal ring

The diagnosis of gonorrhœal epididymitis is generally easy because of its acuteness and the association with gonorrhœa, but in its quieter forms and in those rare cases when it suppurates it may be confused with tuberculous disease. This is particularly the case as examination per rectum frequently discloses prostatic and vesicular disease in tubercle, and there may be a urethral discharge. It is distinguished by the smoothness of the epididymis, which contrasts with the irregularity of the tubercular swelling Gonorrhœal epididymitis very rarely results in abscess formation and then usually breaks at one point only after an acute attack. On the other hand, tubercular disease tends to form multiple fistulæ after a more chronic progress. In the pus of an epididymitis which has broken through the surface; microscopical examination may reveal the gonococcus, while tubercle bacilli may be found in the tubercular fistula. Tubercular disease is often, also, associated with similar disease elsewhere.

From syphilitic disease of the epididymis, the points of distinction will be mentioned below

From **inflammation due to other bacteria**, such as b coli, which are certainly rare but should not be forgotten, it may be impossible to diagnose gonorrhœal epididymitis on the strength of local signs alone. When the epididymis is acutely inflamed, one naturally thinks of gonorrhœa but cases occur in which gonorrhœa, or even exposure to infection, is stoutly denied, and there may be no urethral discharge, or if this exists, it contains no gonococci. The diagnosis then depends on the presence of obvious signs of other bacterial infection of the urinary system, such as b coli pyelitis with cystitis and bacilluria.

Traumatic inflammation of the testicle and epididymis must be distinguished by the absence of associated gonococcal urethritis. It is not safe to rely only on the history of an injury since the latter may precipitate a gonococcal epididymitis in a patient who is already suffering from gonorrhœa.

Mumps may be complicated by orchitis and more rarely by epididymitis. It may also be associated with a urethral discharge. The distinction can be made by the history and the presence or absence of signs of gonorrhœal urethritis.

Developmental cysts and spermatocele would be excluded by the absence of a gonorrhœal history or signs of acute inflammatory changes.

From **malignant disease** of the testicle with secondary involvement of the epididymis, gonorrhœal epididymitis is diagnosed in its acute form by the greater rapidity of its progress and retrogression. If the patient happens to apply for advice when the epididymis is quiet and chronically enlarged, he can generally give a history of an acute attack which coincided with one of gonorrhœa. In regard to progress chronic gonorrhœal epididymitis differs from malignant disease in its stagnation or tendency to retrogression, while the latter progressively advances. Gonorrhœal epididymitis is, moreover mainly confined to the epididymis.

In connection with the diagnosis of gonorrhœal epididymitis, it is well to remember that at the outset its symptoms may closely resemble those of commencing appendicitis. I have been called out so often to see cases of supposed appendicitis which have proved to be commencing right epididymitis, that I make a point of excluding the latter in all such alarms, especially when there is obvious gonorrhœa. In right epididymitis there is often acute pain in the right iliac fossa, vomiting, increase of pulse rate, and rise of temperature. The border of the rectus is not, however so rigid in epididymitis there is often acute tenderness of the epididymis and of the cord, especially at the internal ring the patient does not look so ill as an appendix case requiring immediate operation; and the pulse does not increase progressively in speed. Rectal examination will assist the diagnosis, as in epididymitis a tender enlarged vesicle is often felt. Elevation of the affected testicle, with the application of hot fomentations to the groin, over such a sedative as belladonna, generally results in subsidence of the appendix like symptoms in a few hours. At the same time, cases of epididymitis do occur which imitate appendicitis so closely that the diagnosis may remain in doubt during some hours of careful watching

The syphilitic affections of the testicles are of two main varieties, though the two are often combined. They are diffuse interstitial orchitis, and localised gumma. The former has been ascribed to the so-called secondary stage, and is frequently an earlier syphilitic manifestation than the ordinary gumma. The testicle is at first evenly enlarged, smooth, hard, like india rubber and heavy while pressure generally elicits none of the normal sickly "testicular" feeling The enlargement progresses slowly to an acme over a period of months, and then slowly retrogresses, the testicle shrinking to much less than its former size Eventually in most cases both sides are affected.

Gummata are usually multiple and associated with interstitial orchitis. When they originate near the surface they project from it as smooth, hard bosses, which can easily be made out on palpation. If they are situated wholly within the substance of the testis, the condition may be difficult or impossible to diagnose from the interstitial form.

Gummata usually grow slowly to a maximum and then retrogress. Comparatively rarely however one may break down in the centre, the skin become bluish violet and shiny and the contents of the gumma burst externally The resulting ulcer is crater like, with bluish red, overhanging edges, which become adherent to the base. In *some of these cases a condition of benign fungus results* from the projection of granulations from the ulcer and hernia testis may occur It is difficult to define the epididymis in syphilis of the testicle, owing to the filling in of the sinus epididymidis, or digital fossa, by the thickened tunica, and by the latter pulling the epididymis in towards the testicle. Hydrocele of the tunica vaginalis is commonly associated and it may be necessary to tap the hydrocele before the clinical features can be made out.

Diagnosis—Syphilitic disease of the testicle is distinguished from **tubercular disease** by its painlessness, and its smaller tendency to abscess formation, and by the absence of involvement of the epididymis. Tubercular disease usually involves the epididymis and the cord which stand out prominently It quickly leads to the formation of fistulæ in the scrotum. It is very often associated with tubercular disease elsewhere, and may occur in a non syphilitic subject, so that the Wassermann reaction may be negative.

From malignant tumour syphilitic disease is distinguished by being very *frequently bilateral* by its slower progress, weight, smoothness and painlessness, and by not affecting the cord.

Syphilitic disease of the epididymis is comparatively

rare apart from that of the testicle, but may occur as an early manifestation, i.e. within a few months of the original infection. The upper part of the epididymis is affected, one or more painless elastic swellings occurring there.

It is diagnosed from recovering gonorrhoeal epididymitis by its association with syphilis rather than gonorrhoea, and by absence of any history of an acute inflammatory process or of other signs of inflammation in the epididymis, such as nodular enlargement of the globus minor. Tubercular disease is distinguished by affecting the whole epididymis, its tendency to abscess formation, and involvement of the vas or ductus deferens.

In the diagnosis of syphilitic affections of the testicle and epididymis a positive Wassermann reaction would be evidence for the syphilitic nature of the lesion, but naturally not conclusive, since the reaction might be due to syphilis elsewhere. A negative reaction would support a diagnosis of some non-syphilitic condition.

The Inguinal Region

In cases of gonorrhoeal epididymitis the first sign may be acute pain at the internal ring and tenderness of the cord. The structures of the cord are enlarged and tender and these signs may be much more pronounced than the associated epididymitis. The condition is diagnosed from tubercular disease by being more acute in its progress, by the associated acute epididymitis, and by the presence of gonorrhoeal urethritis.

Palpation of the inguinal glands often discloses unmistakable evidence of syphilis in the primary and early eruptive stages of the disease. It is important to remember however that by no means every primary syphilitic sore is associated with typically enlarged glands in the groin, as in many cases the glands are no more apparent than the small nodules often felt in perfectly healthy men. It would be a mistake, therefore, to think

that every bullet felt in the groin in association with a sore on the external genitals proclaimed the syphilitic nature of the latter as is often done, and it would also be wrong to exclude syphilis from the absence of typical glands.

In women there may be a very good reason for the non-enlargement of the inguinal glands since the lymphatics from the cervix and vagina, which may be sites of primary sores, drain to the abdomen. Syphilis is not to be excluded if the glands are suppurating since suppuration is quite often associated with a primary syphilitic sore on the genitals when this accompanies a chancroid or other septic condition.

Typical syphilitic glands are large, smooth painless, and more or less egg shaped, and can often be seen bulging out the skin over them. They have a characteristic, india rubber like feel, and are freely movable under the skin, which is unchanged in appearance. Puncture of enlarged glands and microscopical examination of the aspirated gland juice is a convenient method of clinching a diagnosis of syphilis when the sore has been dressed with antiseptics or has healed. If typical glands are found exclusively in the outer third of the groin a close search should be made for a primary lesion about the anus.

Suppuration of the inguinal glands is usually associated with soft chancre on the external genitals, but does not exclude syphilis. The original soft sore may have healed completely when the glands begin to suppurate, and may in fact, have been so trivial as to have passed unnoticed. Suppuration sometimes occurs in association with gonorrhœa, but it is a great rarity

The ordinary bubo which occurs in connection with soft chancre is easy to diagnose from suppurative processes due to non venereal causes, such as tubercle, by its greater acuteness. Naturally absorption from other foci such as boils, septic wounds and impetigo should be excluded.

The affected glands become painful and tender the skin over them soon becomes adherent, reddens, becomes shiny

and, unless the process is arrested by treatment, quickly gives way in one or more spots. The result is a fistula leading into a cavity which is covered with very thin skin. The opening enlarges later and there is left an ulcer with considerably undermined edges. Fistulous openings may lead to deeper glands beneath the superficial fascia further along the groin. The process may become a very chronic one, lasting many months, during which one gland after another is implicated and the groin may be riddled with sinuses. **Inguinal or femoral epiplocele or bubonocele** may imitate an enlarged, inflamed gland fairly closely and is distinguished by its definite connection with one or other ring.

Serpiginous ulceration of the groin may occur as an extension of a similar process on the external genitals, or may start from a suppurating gland. The process may cover the whole groin, healing at its oldest parts, and extending at its margin, until after many months it may reach the outer part of the groin and spread over the buttock and down the thigh. It is very uncommon, and fortunately so, because it is very intractable. I once saw a case of this nature which defied every treatment for over a year and was, incidentally a warning not to apply a certain method of diagnosis which is often recommended in text books. The diagnosis having been in doubt in the early stages, some of the pus from the ulcer had been inoculated into the skin of one forearm, on the principle that, if the lesion were syphilitic no sore would result from the inoculation. The result was an ulcer which eventually covered most of the limb.

Gumma of the groin is rare. It occurs first as a nodule, and on breaking down leaves a typical crater like ulcer with base covered with a wash leather slough, and with overhanging walls. The whole process is much quieter than that which results from septic ulcers on the external genitals.

The Anal Region and Rectum

Gonococcal affections of the rectum are generally overlooked, since the symptoms are so indefinite. It is much commoner in women and in the acute form may be demonstrated by running a finger along the posterior vaginal wall and so compressing a drop of pus from the anus. The patient suffers from painful defæcation, tenesmus, and pruritus. A narrow superficial fissure at the posterior margin of the anus, and a thin, very soft, shiny and almost painless condyloma there are believed to be diagnostic of gonorrhœa.

Ano-rectal gonorrhœa may cause ischio-rectal abscess by damaging the rectal mucous membrane and permitting *the entrance of other micro-organisms. It is also one of* the causes of stricture of the rectum owing to the formation of cicatricial tissue which follows on chronic gonorrhœal peri proctitis. The stricture forms a circular fibrous band around the lower end of the rectum.

Syphilis may affect the anus and rectum in all its stages.

Primary syphilitic sores are generally discovered in the rectum only when a patient suffering from secondary syphilis shows none elsewhere. Otherwise they are overlooked unless an enlarged gland in the outer third of the groin rouses the suspicion. The examining finger finds, anywhere up to two inches above the anus, a fairly well defined disc, with a slightly depressed centre, and about half an inch across. The speculum reveals a round or oval sore standing alone on the rectal mucous membrane. There may be no symptoms unless the sore encroaches on the anus, which is then fissured. The spirochæta pallida can be found in the discharge.

In the secondary stage a mucous patch is often found just within the anus. It generally co-exists with other obvious signs of syphilis and has the same appearance as similar lesions in the mouth—a greyish-white patch, about the

size of a little finger nail, and surrounded by a pinkish-red areola.

The most important lesions to be found in the anal region are broad condylomata. These are situated on the contiguous surfaces of both buttocks and give off a characteristically fœtid odour. They are flat, tough, warty growths which are greyish-white, and moist; similar, in fact, to those already described in connection with the contiguous surfaces of the scrotum and thighs. They are found about the same time as the latter in cases of relapse, and where the disease has existed for about three months without the administration of any treatment. They may be few and discrete, or the whole of each cheek may be covered with one mass of them. They are easily recognised, and signs of their presence remain for many weeks as slightly raised, brownish-red plaques.

Tertiary lesions of the rectum are important, since they may lead to much suffering and ill health. As is usual with mucous membranes, they may consist of local gummata, or diffuse gummatous infiltration of the submucous tissues.

Local gummata are commoner in women. They occur as round, elastic, submucous swellings, which vary in size from a pea to an orange. They increase in size in both directions, and in women may lead to perforation of the rectum, and recto-vaginal fistula. The vaginal ulcer which results may be the commencement of an ulcerative and fistulous process which tracts far out into the ischio-rectal fossa.

Diffuse gummatous infiltration of the rectum is also commoner in women, and generally occurs within four years of infection. It commences just within the anus, a point of distinction from cancer, which starts higher up. The patient complains of tenesmus and the passage of a foul discharge. Examination per rectum with the finger shows the mucous membrane to be stiff and inelastic, and the speculum discloses numerous crateriform ulcers with

sharply defined edges. The ulceration spreads upwards and eventually leads to considerable narrowing of the passage. Sometimes in these cases the anus may be surrounded with a ring of prominent soft fleshy growths which are radially arranged being flattened by pressure one against the other and have narrow irregular edges. They were likened by Paget to cockscombs. He considered them to be almost pathognomonic of syphilitic ulceration of the rectum. They differ from broad condylomata in having very narrow bases in comparison with their height, and in being fleshy rather than warty in consistence.

Stricture of the rectum is a common result of syphilitic ulceration. In itself it causes no particular symptoms until the stenosis has become pronounced when alternate constipation and diarrhœa occur the constipation becoming acute at intervals. If the bowel is ulcerated the patient complains of passing a large quantity of pus on rising in the morning This is followed by the normal daily motion and then, at intervals during the day there is the passage of smaller amounts of pus. On examination per rectum, the latter is funnel like, and the stricture is found four inches or more above the anus.

Fournier described a form of syphiloma of the rectum in which the submucous tissues are infiltrated, and stricture results without any ulceration. D Arcy Power considers that in most of these cases there has been previous ulceration, as shown by bluish white scars and the history of attacks of tenesmus and discharge of pus per rectum. It is possible that a number of these cases are really gonorrhœal in origin.

Diagnosis of Syphilitic Ulceration of the Rectum.—The early recognition of syphilitic ulceration of the rectum is important, since unless it is quickly stopped a great amount of suffering and ill health results, not to mention the risks of stenosis. The history of syphilis and the occurrence of ulcers within the anus rather than higher up the rectum, as well as the age and appearance of the

patient, whether tubercular or not, are of some importance. Tubercular ulcer is more irregular its edges are under mined, and the surrounding tissue is not infiltrated.

Carcinoma occurs higher up the lesion is not multiple but single and the surface of the growth is prominent, with a fungating surface. It does not circumscribe the bowel, but remains local at one spot. On examination per rectum, the latter is found to be ballooned owing to the atony of the bowel below the growth.

CHAPTER VI

THE TRUNK AND LIMBS—SYPHILITIC AFFECTIONS OF THE SKIN

The lesions found on examination of the trunk and limbs may conveniently be considered together though not exactly in the order in which they are seen during the systematic examination described in Chapter I. Those of the hands and feet are peculiar in many respects, and will be deferred until later

Primary syphilitic sores are found occasionally on the skin of the trunk and limbs, and quite commonly on that of the lower abdomen especially the pubic region. They may be very numerous here, and I once counted as many as forty seven on one man, the virus having obviously gained entrance through numerous well-scratched scabietic lesions. The characteristics of the sore are similar to those already described in connection with the skin of the penis—a circular dark red, more or less raised, plaque-like erosion, about the size of a shilling and generally covered with *a dirty grey crust*. The *sore is surrounded* by a variable area of induration, with which it is matted into a stiffish disc. The typical characters, with the presence of the spirochæta pallida, which is easily found in the exudate from the sore, usually settles its syphilitic nature without any difficulty When there are a number of sores, they may be mistaken for broad papules, but the history usually assists in preventing confusion, and they are more crusted, more indurated than papules, and are slightly indented. In the secondary stage, too, one would probably find other lesions about the body

Secondary and later manifestations of syphilis are found on the trunk and limbs in great variety depending partly on the resistance of the individual and partly on the age of the infection. Since it would be quite impossible in a work of this nature to describe all the varieties of syphilide which may occur on the skin, it may be useful, even at the risk of repeating what has already been written regarding the general characteristics of syphilitic lesions, to enumerate the main points which assist in fixing a diagnosis of syphilis on any particular lesion. The minor details are, after all, of academic interest with which this book cannot concern itself.

The following characteristics are common to almost all syphilitic manifestations

(1) The history usually shows that there was an indolent sore which appeared after an interval of a few weeks from exposure to infection. That after the appearance of the sore an interval of some six to eight weeks elapsed before the first skin eruption appeared. It was then more or less symmetrically distributed over the body and associated perhaps with mouth and throat lesions. No eruption may have been noted, however after the first interval, and the first clinical recurrence may have occurred months, or even years, after the first appearance of a sore. In many cases the manifestations which appeared later were not so numerous and widespread as the first eruption, and tended then to be distributed in circles or segments of circles.

(2) The first eruption usually makes its appearance on the trunk and spreads thence to the limbs. It is generally slow in development and spread, so that while the spots are fresh on the limbs they are fading on the trunk. As a rule, the rash is not irritating and when it does itch this symptom is a very slight one.

(3) The colour of syphilitic skin lesions, though not diagnostic, is generally sufficient to rouse a strong suspicion of their nature It is a tint of red which differs quite distinctly from the bright clear red of inflammatory lesions,

varying from a rather yellowish or pink to a dark or livid red Secondary lesions may however be bright red at first.

(4) All syphilitic lesions have a circular contour if they coalesce the margin of the conjoint lesion is composed of segments of circles which may be large or small.

(5) Practically all are indurated, and when it can be appreciated the induration is of an india rubbery nature. When a syphilitic lesion breaks down, it does so in the centre of the induration, where it becomes crusted. Bordering the crust, however can generally be found a raised ring of indurated tissue, *however narrow the latter may be*

(6) Syphilitic skin lesions are situated in, and not on, the skin. If a rash is found to be affecting only the very top layers of the skin if so to speak, it is not well grounded in it, it is pretty certain not to be syphilitic. As a general rule, the older the infection the deeper the lesion is imbedded.

(7) Although many syphilitic rashes imitate pretty closely those of other skin diseases, they generally possess some other characteristic, and that of a syphilitic nature such as enumerated above, which reveals the disguise. The skin disease which is imitated can usually be excluded, *too, by this fact, that it is everywhere true to type,* while in the case of syphilis other skin lesions can be found somewhere about the body which do not conform to the characters of the skin disease which is imitated, but to those of syphilis. It is a good plan in these cases to examine those areas of the skin which are normally moist, such as the anal region, between the scrotum or labia, and the thighs the axillæ under the mammæ, etc. where syphilitic lesions have the characters of moist papules. Naturally non specific and syphilitic skin rashes may co-exist, but in this case the typical lesions of the one serve as a contrast to those of the other disease.

(8) In almost every syphilitic rash of the first year of the

disease, and often later it is practicable to clinch the diagnosis by finding the spirocheta pallida in the serum exudate from it. The spirocheta pallida can be found in all syphilitic lesions, as a matter of fact, but in the later ones, such as late secondary and tertiary the search has to be so prolonged that it is not practicable for routine diagnostic purposes.

(θ) Coincidently with the appearance of a syphilitic skin eruption, the Wassermann reaction is almost always positive. Naturally this is not to indicate that if the Wassermann reaction is positive the skin lesion in question is necessarily syphilitic. But if the other characters of the rash raise a strong suspicion of syphilis, the positive reaction helps to confirm the opinion. If the reaction is negative, although this fact does not over ride the clinical evidence, it would strengthen one's hand in excluding syphilis on clinical grounds. It is necessary to detail these points, since in some quarters there is a tendency to over rate the value of the Wassermann test in the diagnosis of *particular* lesions, while in others its value in diagnosis is denied altogether. In matters of particular diagnosis the Wassermann test is a good servant but a bad master, a valuable aid since it proves that the patient is suffering from syphilis in some form or another but a danger if taken to indicate that any and every lesion which can be seen on the patient is syphilitic.

Naturally absence of any or most of the above general characteristics does not exclude syphilis, but the more of them discovered, the more certain the diagnosis, and it is a great help in diagnosis if each of them is searched for in turn, so that, when all the evidence has been gathered, the judgment may be founded on as broad a basis as possible. It is a common mistake to label as syphilitic every rash which appears on a patient with a history of syphilis, regardless of its clinical features. One should, of course, examine such rashes particularly carefully so as not to fall into the opposite error but it is

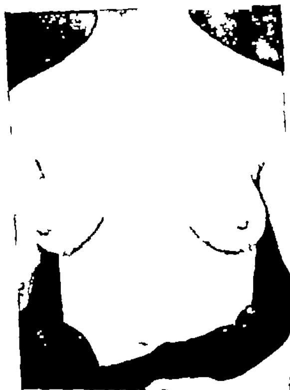
possible to inflict much unnecessary mental torture on some patients by diagnosing simple skin diseases as recurrences of their old trouble.

Syphilitic rashes may be divided broadly into erythematous or maculo roseolar and papular according to whether the *spots are practically level with the skin or* stand out as excrescences from it. The papular syphilide is subdivided into a number of varieties which will be mentioned in more detail later

Two three, or more varieties of syphilide may co-exist in the same patient, and as already mentioned, this polymorphism may be of some value in the diagnosis.

The maculo-roseolar syphilide (Plate V) is usually the earliest and probably the commonest of syphilitic rashes, though it is often overlooked, because in many cases it does not stand out so prominently as others. It appears at first as a very faint erythema on the sides of the chest and belly about six to eight weeks from the first appearance of the chancre, and develops into pink or red spots, which are round or oval, and vary in size from a split pea to a large bean. The rash spreads gradually during the *next two or three weeks over the whole trunk and to the* extremities. The spots appear to be situated in the deeper layers of the skin and the epidermis over them is level with the *surrounding skin*, but may be very slightly raised (syphilitic urticaria). The colour of the spots blends at first so well with that of the skin that the rash may easily be overlooked. It should be looked for in good daylight or electric light, and *stands out better when the patient* has been stripped for some minutes. The blanching of the normal skin produced by the cold then provides the necessary contrast. The colour of the spots deepens with age to a dull, yellowish or brownish-red and then they leave a yellow tint on pressure. On fading some brownish pigmentation is left, which lasts in most cases for only a few weeks. If the patient is first seen when the rash has been out for some time, there may be only pigmenta

PLATE V



Early roseolar eruption.

tion on the trunk, while fresh spots are present on the extremities.

The number of spots and their development vary greatly There may be only a few scattered about which quickly disappear or the whole trunk and limbs may be thickly covered with them, producing a very striking and easily recognised picture.

The above distribution is that of the rash when it shows itself in the early stages of syphilis The distribution is usually different when it recurs It is then much more limited, and the tendency is to occur in groups or circles of larger spots about the size of a sixpence, especially over the flanks, shoulders, buttocks, and the fronts of the forearms.

Diagnosis —The roseolar syphilide may be confused with (1) other erythemata, (2) pityriasis rosea, (3) seborrhoea, (4) certain parasitic rashes, (5) certain drug rashes, and (6) the rashes of certain exanthemata.

Erythema multiforme is distinguished by commencing first on the backs of the hands, which the syphilitic roseola rarely affects. The spots are brighter red, more superficial, and itch or burn, whil they often become vesicular or bullous, and the skin generally is urticarial in tendency

Pityriasis rosea may resemble syphilitic roseola in its colour (though this is usually brighter), and in its gyrate or circular tendency It is more superficial, with a centre which is covered with branny scales, and it itches slightly Examination of the trunk (near the waist line especially) will usually discover a larger "herald patch.

Seborrhoea is often mistaken for syphilis, especially in those with an old history of this disease, since it imitates the syphilide in colour and frequently in its annular contour or in the circinate form of its margin. *It is easily* distinguished by being distinctly more superficial and by its greasy scales. In those with a history of syphilis the age of the infection may also be of some assistance. The syphilide which is imitated is one of the earliest types

while in seborrhœa the initial sore may date back many years

Tinea versicolor has a very superficial resemblance to a faded syphilitic roseola. It is distinguished by its different distribution affecting almost exclusively the front of the chest and between the shoulders it occurs also in yellow brown irregular patches, around which are generally found a number of small spots of the same nature it is not imbedded in the skin but situated on the top layers of it. Microscopical examination of the very superficial layers removed by gentle scraping shows the fungus.

Maculæ cœruleæ produced by the bites of lice are slatey blue and do not change with time.

Drug rashes, such as those produced by copaiba, cubebs, quinine, antipyrin, and belladonna, are usually more acute in their onset and disappearance. Their colour is distinctly brighter and they itch. The patient can usually throw light on the nature of such rashes by admitting the taking of medicine.

The rash of specific fevers can usually be distinguished from the roseolar syphilide by associated constitutional symptoms, which are usually much more severe.

Marbling of the skin from cold might be taken for syphilitic roseola by those who did not consider details. It forms a livid blue network enclosing normal skin. A maculo-roseolar eruption, on the other hand, forms patches which are enclosed by a network of normal skin.

Papular Syphilides of the Trunk and Limbs.—The papular syphilides may be divided broadly into flat topped and conical or follicular varieties of which by far the commonest is the flat topped. Each in turn is subdivided according to the manner of its evolution into papulo-squamous, when scaling is a prominent feature papulo-pustular when it breaks down into a pustule or pustular when the breaking-down proceeds so rapidly that the papular element is hardly seen. Next to the ordinary papular syphilide the papulo-squamous is commonest, then

the papulo-pustular and lastly the pustular It is very common to find two or three varieties on the same patient, especially the papular and papulo-squamous.

The essential features of the individual papule as it makes its appearance is a raised spot, which is bright red at first, but quickly becomes dull red, or brown, fading eventually to a brownish or yellowish-brown pigmented spot which persists for a long time.

The flat papular syphilide is usually divided into large and small varieties, of which the commoner is the small, but the two really merge into one another by all gradations of size, and all of these often appear together on the same patient. The small flat papular syphilide makes its appearance closely on the heels of the macular ten or twelve weeks after the outbreak of the sore, and papules are often found springing from the centres of macules. On the other hand, the papular eruption may apparently be the first manifestation of syphilis after the primary sore, though in many of these cases it is probable that a quickly fading macular eruption did precede the papular The spots are at first bright and then dull red, and vary in size from a pin's head to a split pea. Like the macular eruption, they appear first on the sides of the chest and abdomen, and spread thence in successive crops during the next two or more weeks over the trunk and limbs, affecting especially the flexor surfaces of the latter On picking up a papule between finger and thumb it feels hard and well grounded in the skin it becomes yellowish white when squeezed, and its surface cracks slightly

The number of papules may be very small and scattered, but generally they are thickly spread, and the closely set, dark-red spots covering the trunk and limbs make a picture of syphilis which could not well be mistaken for any other The spots generally remain discrete but, especially in certain areas, as the flexures and between the buttocks, may run together into plaques.

The large flat papular eruption is similar in most respects

to the small variety but the number of spots is generally much smaller and their size considerably larger It is usually combined with the small variety but may occur alone. Large papules occur most often at the bends of the knees and elbows, about the umbilicus, on the inner surfaces of the thighs, and on the nape of the neck.

A **syphilitic papule is always covered with a scale**, but this is so closely adherent at first that it does not seem to alter the red colour and is apparent only when one squeezes the papule between finger and thumb or scratches its surface with a sharp pointed instrument, with which the scale can fairly easily be removed, leaving the shiny papule below With age, some separation of white scales occurs and this may be a prominent feature (papulo-squamous eruption) in some cases being so marked as to resemble psoriasis (syphilitic psoriasis) In the papular eruptions of relapse cases a group of silvery scales often occupies the centre of the lesion but the common appearance is a white scaly fringe or collar around the base of the red papule.

In situations where the parts are moist and rub against one another the appearance of the papule is rather different from the above, owing chiefly to the maceration of the superficial epidermis, with or without the tendency to proliferation. In the axillæ, beneath the pendulant mammæ and, as already described, about the vulva, around the anus, and on the scrotum and inner surfaces of the thighs, the surface epithelium becomes moist and sodden so that it remains as a greyish white covering on being removed by friction, a moist oozing red spot is left with a loose fringe of sodden epithelium around it. Or in the same situation, the papules become aggregated into prominent warty out growths, *broad condylomata*, which have already been described.

The brownish-red pigmentation of skin papules and the shrunken remains of broad syphilitic condylomata persist for many weeks or months. The best areas in which to

find the former are the insides of the legs just above the ankles, the insides of the thighs above, and the flexor surfaces of the elbows.

The conical, papular or follicular syphilide is a rarer form than the flat, and is generally later in making its appearance. The individual papule is a conical spot which is at first bright, and later brownish-red to yellow brown. Closer inspection shows that it develops around the mouth of a sweat duct or a sebaceous follicle, the papule being often perforated by a hair It is generally tipped with a tiny scale and occurs in two varieties, according to the size of the papules.

The small follicular or miliary syphilide is usually earlier in making its appearance than the large follicular. It may be difficult to discover owing to the yellowish brown colour of the minute papules blending so well with the surrounding skin. The papules are generally set in groups, often diamond-shaped, of fifteen or twenty every follicle in the group being affected so as to give a goose-skin appearance to the affected area. The back and the outer sides of the thighs and arms are favourite sites, but the rash may be universal. The small groups of minute, closely set, brown papules scattered about the back, giving it an appearance of having been imperfectly washed, produce a very characteristic appearance.

The larger follicular syphilide may occur early but is usually a late manifestation of syphilis, and then often constitutes the corymbose syphilide mentioned below

The papular eruptions of later or relapse, cases of syphilis differ from those of the earlier types in their distribution. The papules are generally of the follicular type and grouped in circular patches, which vary in size from a walnut to the palm of the hand, with wide areas of normal skin between the patches. The arrangement of the papules in the patches varies somewhat. In some cases, particularly the large follicular type, they are grouped in bunches (*corymbose syphilide*). In this form the group of

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papules may all be of the same size but the most usual appearance is a large central surrounded by a ring of much smaller ' satellite, papules, covering an area the size of half a crown or larger These groups may occur anywhere about the body but especially in the lumbar and gluteal regions, the back of the shoulders, and on the extensor surfaces of the limbs. From the corymbose syphilide to the nodular cutaneous which is described below is a very short step and cases occur in which it is difficult to decide whether the lesion should be classed as a corymbose or a nodular syphilide. Rings and segments of circles without a central papule are also common arrangements of later papular syphilides of the trunk and limbs, especially in the moist areas. They have been mentioned in connection with the scrotum and occur also in the axillæ, beneath the mammæ, and in the flexures generally

Diagnosis—The average case of papular syphilide is easy to recognise by the round contour of the papules their induration, general distribution over the whole trunk and limbs and characteristic colour Certain rarer forms of papular syphilide may resemble other skin diseases and may be mistaken for them especially when faith is pinned on one clinical sign only But if the observer will take care to search for other evidences of syphilis and found his diagnosis on as broad a basis as possible, difficulties will be rare. In cases of doubt, the diagnosis can almost always be settled by resort to the microscope.

Psoriasis (fig 15) especially the punctate and guttate forms may be imitated in two ways. The large papular syphilide may appear like a case of early psoriasis in which scaling has not commenced. The papulo-squamous syphilide in which scaling is very free may closely resemble the developed psoriasis especially when the individual lesions have become confluent. The foundation of the psoriasis plaque is usually brighter red and is not nearly so deeply imbedded as the syphilitic. The scales of psoriasis are more closely set and more silvery when they

are lifted or scraped off with a blunt instrument a number of bleeding points are left on a foundation which is not so raised as the syphilitic papule. On the other hand, removal of the whole scaly cover of a syphilitic papule,



FIG. 15. Psoriasis. (From photograph kindly lent by Captain A. M. De [illegible].)

even with comparatively hard scraping leaves simply the glazed, red papule below. Psoriasis hardly ever spares the extensor surfaces of the knees and elbows, while the papulo-squamous syphilide may easily leave these parts alone. Psoriasis affects especially the backs of the hands, and the papulo-squamous eruption of syphilis the flexures,

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colour of the spots, the tendency to form vesicles, to weep, and to become confluent, as well as in the very pronounced itching. It must be remembered that syphilitic rashes sometimes itch slightly so that it would be a mistake to exclude syphilis solely on account of this symptom. One should say rather that a rash which did not itch would suggest syphilis.

Lichen scrofulosorum may resemble the miliary syphilide, but differs from it in the paler colour of the papules; in its distribution in little groups on the lower part of the trunk; and in occurring exclusively in tubercular subjects. These too, are often younger than the syphilitic.

Ringworm is distinguished from an annular or circinate syphilide by the inflammatory nature of the border which is much less infiltrated than in any form of syphilis, and the scales covering it are lighter. It itches, and the fungus can be found in scrapings.

Tinea cruris or Dhobie's itch, which affects the inner and upper surfaces of the thighs could hardly be confused with a syphilide. The colour of the patch is brighter red, and the margin not infiltrated. The subjective symptoms of itching and soreness are marked, and the presence of the fungus serves to complete the exclusion of syphilis.

Pustular Syphilides.—The occurrence of a few pustules scattered amongst the papules of a syphilide is comparatively common, but the cases in which pustulation is so extensive that it is an outstanding feature are rare. The subjects are generally of the weakly anaemic type, and those in whom treatment has been neglected. The classification of the pustular syphilides must necessarily be somewhat arbitrary since the various types merge into one another by insensible degrees of severity. It is, therefore, wise, in taking notes, to describe the lesions of the particular case rather more fully than by means of an arbitrary terminology which to another reader or at a later date, may represent something very different from that originally intended. On the whole, the earliest pustular syphilides

palms, and soles while, unlike the case of psoriasis, it is common to find involvement of mucous membranes. Psoriasis remains dry in moist areas the syphilide usually takes on the characters of the moist papule described above. In psoriasis there is practically always involvement of the scalp even if this is only seborrhœic. With regard to the Wassermann test, some caution should be exercised over accepting a positive reaction in favour of syphilis as against psoriasis I have seen numbers of cases of psoriasis where syphilis could be excluded by all other evidence, but a positive reaction was reported (see p 270)

Lichen ruber planus differs in the polygonal outline of the spots, their violet tint and waxy glistening appearance when looked at obliquely The rash is a more irritable one than the usual syphilide. Its distribution favours the anterior surface of the forearms and nape of the neck. The mucous membranes should be searched for the characteristic sand like seedlings of lichen.

Acne spots which have not yet suppurated or have resolved leaving dark red nodules may raise a suspicion of syphilis but there are usually other signs of typical acne about the skin, with comedones, especially on the upper chest and between the shoulders. The spots are usually *more inflammatory* and the contents of most of them can be pressed out. It is usually easy enough to recognise acne but the difficulty is to exclude syphilitic papules in an acne subject with a history of syphilis. The quickest plan is to search parts not usually affected by acne, such as the bends of the knees and elbows the scrotum and glans penis and the mouth and throat.

Molluscum spots differ in being pearly white, and umbilicated and in standing out much more boldly from the skin. Also caseous matter can be expressed from the small orifice in the central depression on the summit of a molluscum lesion

Eczema papulosum differs generally in the angrier

form and the varioliform is that in the former a vesicle appears first, and the contents become cloudy after some days, while in the varioliform the first appearance is a pustule. The pustule dries up to a brownish crust resting on a dark-red base, and the eruption appears in crops, so that pustules in all stages of development are found on the body

Since the patient may be feverish the eruption may be mistaken for chicken-pox or small pox according to the case. The most useful points of distinction are as follows

Varicella is excluded by the more superficial nature of its lesions, which do not rest on a firmly-imbedded dark red papule by absence of the spirochæta pallida from the serum-exudate of the pocks and of other symptoms of syphilis, in mouth, throat, etc.

Small-pox is excluded by the absence of the dark red foundation of the individual pustule, and by absence of the spirochæta pallida and other manifestations of syphilis. The eruption of small pox is preceded by fever and other constitutional disturbances, with severe lumbar pains, and the eruption favours the face, backs of the hands, and wrists. These are situations which are not specially affected by the pustular syphilide, in which the eruption is probably much more profuse on the trunk. In the small pox eruption the pustules are in much the same stage of development all over whereas in the pustular syphilide, spots in all stages of development will be found on the same patient. Confirmation is obtained from the history slow evolution, and chronicity of the pustular syphilide, which contrasts with the rapid march of events in small-pox.

The pustular eruptions produced by **bromides** and **iodides** are distinguished by their acute development and inflammatory rather than syphilitic characteristics, and by their association with the taking of medicines which are known to contain these remedies.

The impetiginous syphilide in the areas under discussion usually forms on hairy parts such as the pubes

appear later than the papular or roseolar generally from six months to two years after the chancre, though cases occur in which they rapidly follow on the heels of the chancre. As a general rule, when they appear early they are more generalised over the body and the constitutional symptoms are more severe. Later pustular syphilides are confined to a comparatively few patches of aggregated lesions.

For descriptive purposes, one may divide the pustular syphilides according to the severity of the tissue destruction into acneiform, varioliform impetiginform, and superficial and deep ecthymatous. The first named is a rash in which the papular element is definite at first and the pustulation is produced by central necrosis. The last named is one in which the lesion is much larger and deeper the papule is a very fleeting element, and not only is pustulation with crust formation a prominent feature, but beneath the crust there is spreading destruction of tissue with the formation of large, heaped-up crusts of characteristic appearance (rupia).

The acneiform syphilide is generally associated with the follicular type of papular syphilide The centre of the papule becomes purulent, so that a pustule resting on a dark red base is formed. On drying a brown crust is formed tipping the papule and a small pigmented scar may be left.

The diagnosis is not as a rule difficult because of the presence of other syphilitic lesions. Confusion with acne is avoided by searching in places not usually affected by the latter such as the flexures of the limbs, etc. If the patient is not subject to acne the absence of comedones, inflammatory lumps, and so on, which are characteristic of acne, about the face and between the shoulders, or on the back, usually settles the diagnosis easily

Varioliform and varicelliform syphilides are characterised by more extensive breaking down of the papule which becomes mostly pustule, though without any tendency to increase in size. The chief distinction between the varicelli

other crusted eruptions as impetigo, ecthyma, eczema, and scabies by the darker colour of the crusts, and the fact that they are more adherent, and cover more definitely



FIG. 16. Rupia.

ulcerated areas. All syphilides in which crusting occurs are liable to be mistaken for impetigo, but the latter is a much more superficial affection, and is associated with some septic adenitis, which is absent in the syphilide. The

and lower abdomen. As will be shown, it occurs also on the scalp beard forehead angle of nose and chin. *Individual pustules* dry up and are covered with brownish yellow crusts the crusts of neighbouring pustules uniting to cover quite large areas. When the crust is removed the underlying surface is found to be superficially eroded.

In **pustular eczema and impetigo** there is much less erosion or ulceration under the crusts, but much more surrounding inflammatory reaction, and other signs of syphilis are absent.

Echthymatous syphilides are divided into superficial and deep the former being a comparatively early manifestation, occurring within six months of the chancre and usually associated with a generalised papular or pustular eruption, while the deep variety appears later

In the **superficial echthymatous syphilide** the pustule becomes covered with a heaped up brownish crust, and on lifting the latter a small ulcer is found. The underlying papule is softer than in the ordinary pustular syphilide. The condition is very similar to the impetiginous variety but rather more severe, and not confined to the hairy parts.

The deep echthymatous syphilide, or rupia (fig 16) occurs from one to two years after the chancre, though exceptionally it may appear earlier or much later It is a manifestation of low resistance on the part of the patient, and a much more severe syphilide than those already mentioned. The individual pustule becomes covered with a dark brownish-red or greenish scab under which, owing to the peripheral extension of ulceration, *successive layers* of crust are formed each wider than its predecessor until there is produced a somewhat conical, laminated, *blackish* crust, like an oyster or a limpet shell. The process is a very chronic, resistant one, and on healing leaves circular or oval scars with pigmented borders, which mark the site of the eruption for years afterwards.

The echthymatous syphilides are distinguished from such

other crusted eruptions as impetigo, ecthyma, eczema, and scabies by the darker colour of the crusts, and the fact that they are more adherent, and cover more definitely



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FIG. 14. Rupia.

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history and presence of other signs of syphilis should prevent a crusted syphilide being mistaken for impetigo The Wassermann test is of distinct value in assisting the diagnosis, but it is difficult to find pallida in such syphilides.

Bullous syphilides are so rare in connection with acquired syphilis that their description will be reserved for inclusion amongst the special manifestations of congenital syphilis. Rupia, however is believed by some to be preceded by a bulla.

Vesicular syphilides are described in which small vesicles form on raised nodules, but they are so rare that their discussion is outside the scope of this work.

A form of thrombo-phlebitis, which is commoner in women occasionally produces an **erythema nodosum**. In these cases, before the first eruption or during the first year of the disease, round or spindle-shaped swellings are found on the extremities, especially the legs. The skin is at first movable over the swelling but eventually the latter becomes adherent, and a nodule the size of a shilling results or by confluence of a number of nodules prominent hard nodes are formed, the skin over which is first red and then livid. Some of these may break down in the centre and, *after discharging some sanious pus*, leave a small crateriform ulcer with overhanging edges. The nodes are less painful than those of ordinary erythema nodosum and of course react to syphilitic treatment.

Late Secondary or **Early Tertiary Syphilides.**—*As is well known syphilitic affections are commonly divided into* primary secondary and tertiary But although it may be possible to draw a dividing line clinically between the primary and secondary stages, this is impossible between the secondary and tertiary since the two stages merge into one another by almost insensible gradations. As a matter of fact some of the lesions already described, such as rupia and the corymbose syphilide, are classed by some authors *as secondary* and by others as tertiary

PLATE VI



Nodular cutaneous syphilide, front of elbow

The lesion about to be described, although usually designated tertiary, differs comparatively slightly from the recurrent papular eruption of the secondary stage of syphilis.

The nodular, tuberose, or tubercular syphilide (Plates VI–VIII and figs. 17 and 18) is easily recognised. The



f i \ lul on uous yphilide of superficial type.

d veloped l-si aries size from an area which could be co red w th a thumb to on which is larger than two hands. It outline of deeply set, brownish-red nodules is usually either roughly circular or made up of one or more segm nt of wide ircles, which may unite end to end to form a wavy snake-like line of varying length. I other cases the lesion is composed of a series of either

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concentric or irregularly arranged circles Sometimes three or four parallel straight lines occur close together like ridges with narrow valleys between The nodules are



Fig 18. Nodular cutaneous syphilide of ulcerative type.

skin gummata, each about the size of a small pea, which run together to form a more or less continuous line or ridge, broken here and there by a few isolated nodules.

PLATE VII



Nodular cutaneous syphilide showing concentric arrangement of nodules and scaling of advancing margin.

The ridge, which is covered with loose scales or light crusts, is clearly defined on the side next to the normal skin, standing up from the latter to a height of about two thicknesses of blotting paper. On its other side it either completely or partially encloses a reddened or yellowish



Fig. 18.—Ulcerating [illegible] gummata. (From a photograph kindly lent by [illegible] W. Brown.)

brown or a whitish hue; on closer inspection a network of slightly raised ridges of deeply pigmented but otherwise normal skin, enclosing in its meshes a number of small, slightly depressed, superficial scars. The scaling covers that part of the infiltrate which is in process of retrogression, while the scarring represents the complete process.

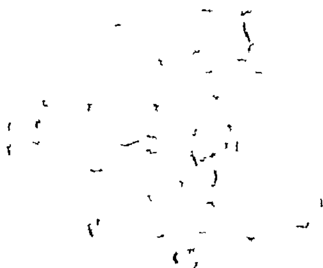
The disease constantly and slowly advances, invading the skin beyond the ridge by the laying down of fresh infiltrate on the advancing face of the latter or by the formation of fresh nodules in concentric circles just beyond it (Plate VIII) In mild cases when the lesion is small there may be little or no scarring In more severe cases the ridge may be wholly or partially ulcerated, being covered with a crust, the removal of which discloses a number of small ulcers, or perhaps one long narrow sharply defined, trench like ulcer which is comparatively superficial (fig 18) Exceptionally the crust becomes heaped up in the rupial manner In still more severe cases the ulceration proceeds at a greater rate than the process of repair and the ridge of advancing infiltrate encloses a superficially ulcerated area in place of the network mentioned above (fig 19)

It is usually possible in these cases to find somewhere about the body lesions which are in the earliest stages of a nodular syphilide, such as a small group of closely aggregated skin gummata which may have run together to form a large nodule with a depressed centre. The centrifugal method of extension with perhaps the stoppage of the process along one segment of the circle accounts for the gyrate boundary of the developed lesion.

In the areas of the body which are at present under discussion the nodular syphilide may be found anywhere, but particularly favours the regions just above and below the iliac crest behind, about the shoulders, and the flexor surfaces of the joints. When odd out of-the-way spots are affected it is common to find that these are the sites of old injuries or of occupational stress. This is in agreement with the rule of syphilitic manifestations that they affect, for preference, areas which are unduly handicapped by stress of work, or by injury

Diagnosis—The nodular syphilide is quite easily recognised by the characters which have been described above when the observer has seen a few examples. It is

PLATE VIII



Nodular cutaneous syphilide, sacral region, almost quiescent.

most likely to be confused with lupus vulgaris, and a careless observer might mistake it for ringworm.

Lupus vulgaris is distinguished by the following points. Lupus will usually be found in young and delicate subjects, while the syphilide affects those of maturer years who are not necessarily at all delicate. The associated stigmata of lupus are those of tubercle, while in the case of the syphilide there may be found a gumma or other sign of syphilis to help the diagnosis. Lupus grows at the rate of about half an inch a year and the syphilide at about ten times this pace. While the edge of a nodular syphilide is definite that of lupus is ill-defined, and while the advance of the syphilide is by creeping forward of the ridge, or by formation of concentric ridges, lupus advances by outlying nodules in the healthy skin growing back to and joining up with the old process. When the nodule of the syphilide is pressed with a glass slide it may shine through as a brownish stain, but the lupus nodule shows through as a definite, brownish-yellow apple-jelly body. The lupus ulcer is shallow and indefinite, while the syphilitic is deeper and has the sharply cut, circular character of a tertiary ulcer (figs 18 and 19). The cicatrix left by lupus is much denser and harder more scar like, than the soft, more skin-like remnant of the syphilide. Old lupus nodules are often seen in the lupus scar

Ringworm is a much more superficial process, has no densely infiltrated margin, and leaves no scar in its wake.

sideration the favourite sites of these ulcers are the backs of the calves, especially on their outer aspects, the backs of the thighs, and buttocks, the backs of forearms and elbows, and the outer sides of the knee, but they may occur anywhere.

Diagnosis.—It is not, as a rule, difficult to recognise the gummatous ulcer especially when it occurs in its favourite sites, but difficulty may arise in the distinction from **varicose ulcer**. This usually occurs in the lower part of the leg about the inner malleoli, is more painful, irregular and associated with a considerable amount of eczema, the result of the blood stasis.

Bazin's disease is a tubercular granuloma with nodules in the calves which lead to the formation of ulcers not unlike those due to gummata. It is distinguished by the following points. It occurs most often in young females, before they are likely to show tertiary lesions, unless they are suffering from congenital syphilis. The opening into the ulcer is more fistulous, not so regular as that of the syphilide, and while other signs of syphilis are absent, there may be signs of tubercle elsewhere to assist the diagnosis.

Muscles

Gonococcal myositis is usually diagnosed as a last resource when the patient has suffered from intractable lumbago and an investigation of the urinary passage reveals urethritis. It is difficult to state the true relation of lumbago to gonorrhœa, since it is common enough apart from this disease, and there is no sign by which one form of lumbago can be distinguished from another. Certainly a fair percentage of cases of gonococcal arthritis suffer also from lumbago, which often lasts for a long time after the other symptoms have disappeared; but in how many cases the affection is imaginary and in how many it is real, it is difficult to decide. It is probable that genuine cases of interstitial myositis of the spinal muscles do occur in

CHAPTER VII

TRUNK AND LIMBS (*contd.*) SUBCUTANEOUS TISSUES MUSCLES BONES JOINTS TENDONS AND BURSÆ

SUBCUTANEOUS TISSUES

Subcutaneous gummata grow up out of the subcutaneous tissues as round india rubbery nodules, the size of a bean or bigger eventually becoming adherent to the skin, which at first remains normal in appearance. The nodule may resolve, even after softening in the centre, but when the softening progresses, the skin becomes reddened over the swelling and at last the contents of the gumma break through. The opening enlarges quickly and there is left a typical, punched-out, round or oval, gummatous ulcer with its indurated steep walls, wash leather slough, mucoid discharge, and dull red surrounding areola. The ulcer tends to spread both superficially and deeply in the former case it retains its circular or oval outline unless one segment of the circle stops growing when a crescentic or horseshoe-shaped ulcer is produced. When a few gummata lie close together their resulting ulcers may fuse at the borders and produce a composite ulcer the circumference of which is made up of segments of a number of circles. By extension into the deeper tissues muscles and periosteum may be involved.

In some cases a large area may become indurated into a dull red plaque, which may break down to form one large ulcer or it may break down at many points to produce a number of round, oval, or crescentic ulcers each with the characteristics described above. In the parts under con

sideration the favourite sites of these ulcers are the backs of the calves, especially on their outer aspects, the backs of the thighs, and buttocks, the backs of forearms and elbows, and the outer sides of the knee, but they may occur anywhere.

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MUSCLES

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which the origin is a urethral infection, since some benefit by urethral treatment. More, in my experience, have yielded to free counter irritation.

Syphilitic myositis occurs in different stages of syphilis. Before the outbreak of the eruption there may be considerable aching both at rest and on movement, especially of the flexors and the erector spinæ. The pain is worse at night, as is usual with syphilitic pain and is of the same character as that which follows severe unaccustomed exercise. If there are no other symptoms of syphilis in the form of a rash, etc. it may be mistaken for ordinary rheumatism and treated accordingly with little effect. A closer examination and discovery of a primary sore may lead to a true diagnosis but a suspicion of syphilis may not arise until salicylates have failed to produce any relief or the proper eruption appears. It is possible that this affection is not myositis, but due either to toxæmia or to meningeal syphilis and mild irritation of nerve roots.

About the end of the first year a diffuse interstitial myositis may affect any muscle, but more particularly one of the flexors such as the biceps or the sterno-mastoid. The onset is quiet and often noticed for the first time when the patient finds that he cannot straighten the joint, because of pain. The muscle shortens and gradually if untreated, the limb is held in a position of acute flexion.

Later still, a gumma may form in one or more muscles, especially the triceps, rectus abdominis, tongue, biceps, sterno-mastoid, and calf muscles It is often combined with a diffuse gummatous myositis, in which the muscle is swollen harder than usual and irregular in outline. Individual gummata can be felt in the swollen muscle, which may become adherent to surrounding structures and cause much limitation of movement. The gummata may break through the skin to cause one or more typical tertiary ulcers or without breaking through they may retrogress and lead to shrinking of the whole muscle, which may calcify or even ossify unless treated. Fortunately in this

case, most swellings suggest syphilis, and treatment is not long in following

THE BONES

Syphilitic affections of bones attract attention chiefly in the later stages of syphilis. In some cases however before the first eruption appears, there may be a definitely localised periostitis of exposed bones, such as the tibia, the clavicle, middle pieces of the ribs, and the sternum. The symptoms are chiefly subjective, the patient complaining of intense neuralgic pain in the shins, a stitch in the side, or intense pain over the sternum, all the symptoms being worse at night. Examination in these cases usually discovers a very tender spot somewhere on the surface of the bone, and here there may be a smooth swelling The symptoms quickly resolve with the appearance of the rash and the institution of treatment.

Localised gummatous periostitis is found in the later stages of syphilis as a smooth swelling which is definitely connected with the underlying bone. It affects any bone but more particularly clavicle sternum ribs, and tibia. The overlying skin is at first freely movable and may remain so throughout. The swelling or node may undergo ossification and remain for years as an ivory hard boss on the bone, a sign of considerable value when one is searching the patient for evidences of past syphilis. In course of time the centre of the swelling may break down, and one feels a central depression surrounded by a hard margin, which is steep and definite on the central side, but externally slopes away to the normal surface of the bone. The process may come to an end at this stage, and the wall surrounding the central depression becomes very hard. In other cases the skin is involved and after becoming livid red, gives way to let out the gummatous matter A funnel-shaped ulcer is exposed with its base occupied by a slough which covers bare bone.

Diffuse periostitis is not nearly so common in acquired as in inherited syphilis, and will be considered more particularly in this connection. Two forms of swelling should be considered here, however as they are found in adults and are valuable signs of congenital syphilis.

The first is the "**sabre-scabbard tibia**," which results from earlier syphilitic periostitis. The affected bone is thickened from before backwards and its anterior border is curved with its convexity forwards. The bone is definitely lengthened, and the affection is usually bilateral. The other form is a conical swelling with the widest part of the cone near the epiphysis. It is important since it generally occurs in young adults, and its shape suggests a periosteal sarcoma, from which it is most easily distinguished with the help of a skiagram The latter shows a much clearer and more definite outline than in sarcoma, where the outline is shadowy

Osteitis and osteomyelitis are more often found in congenital syphilis than in acquired but since they occur in young adult life they may be considered here.

In **diffuse osteitis** the bone becomes tender to pressure and generally bigger while the patient complains of aching pains in it. The bone is generally smooth suppuration is not common, but if it occurs, one or more fistulous openings in the skin lead down to a sequestrum in the interior of the bone. The tibia, humerus and femur are the most frequently affected of the long bones.

Localised osteitis, like periostitis, may be found in the clavicle, sternum and ribs, as well as the condyle of a femur or humerus, producing a localised swelling In the clavicle it is very common at the sterno-clavicular joint. In the situations of the condyles it may be mistaken for tubercle, from which it is distinguished by indirect rather than direct methods. The gumma occurs perhaps in a robust patient showing other signs or stigmata of syphilis. The process is altogether a quieter one in syphilis and has less tendency to abscess formation. If an abscess does occur

the fistula is a simple one, not ramifying, as in tubercular disease.

Osteitis of the vertebral column is uncommon and very apt to be overlooked, until, with destruction of bone, an abscess, such as a retropharyngeal, develops, or the patient suddenly becomes kyphotic. Nervous symptoms due to extension of the process to the spinal meninges sometimes follow Vague pains in the back of a patient who is suffering from other syphilitic bone lesions should rouse a suspicion of syphilitic spinal caries and lead to careful examination. The vertebræ most usually affected are the cervical.

Myeloma is distinguished from a localised syphilitic osteitis by its uniform growth egg-shell crackling the evidence of interference with the return blood, which is shown in the engorgement of the skin veins over the swelling and the swelling of the limb below A radiogram shows in myeloma a thin, expanded outline surrounding a rarefied area, which contrasts with the definite periosteal thickening seen in the skiagram of a case of syphilitic osteitis.

Affections of the Joints

A joint affection which simulates rheumatism may be syphilitic or gonorrhoeal, the latter being by far the commoner

Gonococcal arthritis may affect any joint but chiefly favours the knee, ankle, hip elbow shoulder and temporo-maxillary joints. It may be confined to one joint or attack a number sometimes flitting from one to the other as in acute rheumatism. Two forms may be described—acute from the first, and chronic from the first.

In the acute form, the affected joints become exquisitely painful on movement and there is constitutional disturbance, with fever depending on the severity of the local affection. The joint is distended, and if it is superficial the skin over it becomes red, tense, and shining If

aspirated early say within the first week, the gonococcus may be cultivated from the joint fluid Later than this, the chances of discovering the gonococcus in this manner diminish rapidly

The pain and swelling are apt to attack one joint after another but do not leave the originally infected joints so completely as in ordinary acute rheumatism, and there is not the same sour smelling perspiration. Probably the knee and ankle are the most frequently affected and after these, the elbow and wrist. The inflammation may subside very rapidly but in most cases the patient is crippled for many weeks or months.

In other cases the pain and inflammatory signs are not prominent and the constitutional symptoms are negligible, but the joint particularly the knee, is greatly distended with fluid

The form which is chronic from the first simulates osteo-arthritis. Without constitutional disturbances or any great swelling a number of joints become painful and creak on movement, so that the patient is greatly crippled Considerable thickening about the affected joints may result, and unless the condition is patiently treated with massage and movements, the crippling may be permanent.

It is possible that in many of these chronic cases the causal micro-organism is not the gonococcus, but another such as the streptococcus, which has disseminated from a focus in the prostate or seminal vesicles. At any rate, this type of arthritis is more often a complication of chronic urethritis, while the acute form accompanies acute urethritis. In the chronic form, too, it is generally found that numerous other micro-organisms are present in the urethral discharge, while very frequently no gonococci can be found on repeated examination. It is a point which is of some importance to treatment, particularly that by vaccines.

In all cases of arthritis, as in other metastatic complications, the prostate and seminal vesicles should be examined.

They are almost always diseased, and until they are treated, the arthritis will continue.

The diagnosis is usually easy in acute cases, since there is a clear association with acute gonorrhoea.

As a subsidiary diagnostic method which is simple and of distinctly therapeutic value, aspiration of an acutely inflamed joint, naturally under the strictest aseptic precautions, and microscopical or cultural examination of the fluid removed may be valuable.

The diagnosis may be difficult in those cases where the gonorrhoea or urethritis is not very apparent, and the symptoms are those of osteo-arthritis, with limitation of movement, little or no distension of the joint, and pain only on movement. Many such cases are treated as simple rheumatism for weeks, until something prompts an investigation of the urethra, and a slight discharge is discovered, or threads in the urine with prostatic or vesicular disease. The history may help by showing that the first attack of arthritis coincided with one of gonorrhoea. Sometimes it is confusing, as the patient gives a history of rheumatism long before any attack of gonorrhoea and the question then arises whether the present attack results from infection *per urethram*, or is a reminder of the original simple rheumatism. In the present state of knowledge it is impossible to decide such cases with certainty but the indication is to treat the urethritis, on the principle that micro-organisms or toxins absorbed there are likely to attack or aggravate an already damaged joint.

A very common mistake is to diagnose as arthritis a teno-synovitis affecting the tendon sheaths around the joint. This is very often done in affections about the ankle joint and need only be mentioned to be avoided, since closer examination reveals the fact that the inflammation is confined to the tendons. Gonococcal affections of the bursæ around the knee-joint are often diagnosed arthritis, but the absence of general swelling of the joint, and tenderness at one particular spot when the

joint is palpated soon narrow the enquiry down to the bursa under that point. Naturally teno-synovitis, bursitis, and arthritis may co-exist about the same joints.

Syphilitic affections of the joints are infrequent, but must be borne in mind as they yield only to anti-syphilitic treatment. They are more common in congenital syphilis, and will be dealt with in more detail under that section.

Even before the first eruption the patient may complain of acute mono- or polyarticular pain, which is worse at night and on rising in the morning. The affected joints may be tender on pressure, but beyond this there is rarely any physical sign, and the condition is usually overlooked.

During the early eruptive stage one or a succession of joints may be attacked with acute synovitis, in which the periarticular tissues may participate. The affection *is painful, but distinguished from other forms of synovitis* by being particularly worse at night and the fact that movement does not increase the pain. It usually coincides, too, with other signs of syphilis and yields promptly to anti-syphilitic treatment.

Chronic syphilitic synovitis occurring in the secondary stage is a quiet, indolent process, in which uniform distension of a joint, such as the knee or elbow occurs without any great pain or discomfort on movement. It is distinguished by its indolence, association with other signs of syphilis, and response to anti syphilitic treatment.

Charcot's disease *(fig. 20) must be considered here,* although it is not the result of invasion of the joint by *the spirochæta pallida.* The affected joint is usually one which has been subjected to occupational stress, and is most frequently situated in one of the lower limbs. It suddenly becomes distended with fluid without pain or accompanying signs of inflammation or it may suddenly give way under the patient, or become dislocated without apparent cause. The skin over the joint is pale, with distended veins, and there is grating and undue mobility. At a later stage the distension disappears, leaving a flail

joint with eroded articular surfaces, and readily dislocated. In another "atrophic" form, which is much less common, there is no enlargement of the joint, but very considerable wasting of the cartilage, articular ends and shafts of the affected bones. Charcot's joint may occur in any stage



FIG. 39. Charcot's disease of right elbow. Patient was a sailor and had also perforating ulcer of ball of left big toe, both elbow and big toe being parts ... were strained by patient's occupation. (From a photograph kindly lent by Mr. C. H. Mills.)

of tabes, but is particularly important from the diagnostic point of view in the preataxic stage, as it may then be the first symptom to attract attention.

In gummatous arthritis the synovial membrane is generally enormously thickened, and may also be occupied by varying numbers of discrete gummata. The knee is most frequently affected and is uniformly enlarged, with, however

slight or no pain on movement and no wasting of muscles, signs which distinguish the condition from tubercular disease. The gummatous nodules may be felt in the synovial membrane.

In other cases, the gummatous process primarily affects the articular ends which enlarge, and the joint becomes globular without particular thickening of the membrane. The process may spread to the skin and result in external bursting of a gummatous abscess, or may lead to ankylosis, or a flail joint. In both forms the diagnosis is usually assisted by other signs, or a history of syphilis.

Tendons and Bursæ

Teno-synovitis and bursitis may be syphilitic, but are more commonly gonorrhœal in origin

Gonococcal teno-synovitis occurs as an acutely painful inflammation of tendon sheaths which is diagnosed by the associated gonorrhœa. It is a very troublesome and painful complication, often lasting for many weeks and months, although after a period of a few weeks it settles down to a more or less chronic or subacute stage. Occasionally an abscess bursts externally and in all cases there is a great tendency to formation of adhesions, which may cause much limitation of movement.

Gonococcal bursitis is usually associated with teno-synovitis, to the characters and course of which it is very similar It is rather common in the bursa under the tendo Achillis, and may cause considerable lameness for a long time after other symptoms have disappeared.

Syphilitic teno-synovitis is rare in comparison with the gonococcal form. It may occur in the early eruptive stage or much later and is characterised by its painlessness and indolence, although occasionally in the earlier forms the onset may be associated with some pain and redness which soon settles down. Two forms of the **earlier type** are described—one a simple serous inflammation with effusion into the sheath which occurs most frequently on the

back of the wrist, in front of the ankle and at the insertions of the ham-strings. The other is known by a triangular swelling which affects the back of the wrist. The apex of the swelling extends to the dorsal ligament of the wrist and the base is towards the fingers. Both forms are very indolent and lead to limitation of movement, not so much from pain as from the formation of adhesions.

Gummatous teno-synovitis, though commoner than the earlier form is not often seen. It consists in either a diffuse thickening of the sheath for a considerable portion of its length, or the formation of a gummatous mass at one spot, which feels irregular and lumpy. It becomes adherent to the skin, and breaking through it, in the manner of syphilitic gummata, leads to the formation of a syphilitic ulcer which may last for years.

Diagnosis.—Syphilitic teno-synovitis is distinguished from tubercular disease by being confined to the tendon sheath, so that the swelling is on only one side of the joint. Tubercular disease is associated with disease of the adjoining joints, so that swelling can be seen on both sides of it. This applies especially to the wrist. Tubercular disease progresses steadily while syphilitic is more or less stationary unless treated with anti-syphilitic remedies, to which it yields promptly.

Syphilitic bursitis may be found in the earlier stages of syphilis as a serous inflammation producing swollen and tender bursae about any joint. On account of proximity to the joints, it may be mistaken for ordinary rheumatism until a close examination shows that the trouble is in the bursae only.

Gummatous bursitis may occur in the late secondary stage as an indolent, sharply defined tumour or very much later as a hard elastic swelling at the site of the affected bursa. In either case the bursa is usually one on which occupational stress has fallen, such as the prepatellar bursa of women, or the bursa over the tuber ischii in those who sit much.

CHAPTER VIII

THE HANDS AND FEET

GONOCOCCAL AFFECTIONS.—Arthritis, teno-synovitis, and bursitis often occur in both hands and feet, and some of their manifestations as regards the feet have been mentioned above. Gonococcal infections of the joints and ligaments of the feet may result in weakening of these structures, so that flat foot results.

A rare skin disease known as **Hyperkeratosis, or Keratodermia, blenorrhagica** requires mention (figs. 21 and 22). It is usually associated with severe metastatic complications such as arthritis and iritis, and affects especially the margins of the soles, the heels, and balls of the toes. The hands and fingers may participate, and lesions may be found on the skin of the trunk and limbs. The skin of the affected areas becomes tough, like leather and a number of nut brown nodules form in it, which are dome-shaped and vary in diameter from a large pea to a threepenny bit. On pressing such a nodule with the tip of a finger the feeling is as if one were pressing on a blister which had lost its contents but retained its shape, by virtue of the rigidity of its celluloid like covering. The nodules contain a cheesy material in which it is stated that gonococci have been found. Between them the skin also becomes greatly thickened and the appearance is usually described as one of hills and dales. The nails may become enormously thickened and in a case at Rochester Row every finger-nail was at least a quarter of an inch thick at its free margin.



FIG 21 Hyperkeratosis blenorrhagica in desquamating stage. A few nodules left on heels (From a photograph kindly lent by Captain W Brown)

As mentioned, it is a rare affection, the incidence being about one in 5 000 cases of gonorrhœa. The associated metastatic complications are usually so severe as to leave

no doubt regarding the diagnosis of the skin condition, and relegate the latter to a category of minor practical importance. After lasting for some weeks or months, the thickened epidermis of the affected area is cast off in large



FIG 42. Hyperkeratosis blenorrhagica. Nodules, with little desquamation. (From a photograph kindly lent by Captain W Brown.)

pieces, so that the whole plantar covering may be shed in one or two tough casts of the sole and heel.

THE SYPHILITIC AFFECTIONS of the hands and feet are essentially the same as in other parts, but differ in naked eye appearance, chiefly because of the toughness of the epidermis.

Primary syphilitic sores are fairly common on the fingers

and thumbs, owing naturally to the frequency with which these parts are brought into contact with infected material. The appearances differ somewhat according to the position of the sore. When the site of infection is the bed of the



Fig. 23. Healing syphilitic chancre of thumb. (From a photograph kindly lent by Captain A. M. D. [illegible].)

nail or a crack at its margin, an indolent painful ulcer forms with dull-red granulations which may surround the nail in a semilunar manner. In another form, which affects the terminal phalanx, the whole phalanx becomes

red and bulbous. The ulcer is irregular with a dull-red base which is often covered with an adherent diphtheroid membrane. In either case the tissues around are matted into a brawny mass, but this is not a diagnostic feature, since induration is a common event in all inflammatory conditions here. The bone may necrose and the nail is often destroyed. The pain may be excruciating and this with the general appearance, often leads to a diagnosis of whitlow

Another form of chancre, which may be found on any part of the fingers, but more particularly over a joint, is a flat scaly papule which grows until it is about the size of a threepenny bit or less It is often overlooked on account of its trivial appearance.

A chancre also occurs, especially on the ball of the thumb which is similar to those found elsewhere on the skin. It is an indolent sore which is dark red and slightly raised with a flat or slightly depressed top like a plateau. Its *base is as high as or higher than its margin, and it is covered* with a crust, or occupied by prominent, dull red granulations (fig 23) The edge of the ulcer is well defined and regular not undermined but level with the surrounding skin.

All forms of digital chancres are usually surrounded by a dull violaceous areola during resolution. This is a valuable point in their diagnosis.

Diagnosis—Digital chancres are important since they often simulate other conditions very closely and may easily be overlooked Septic sores are so common about these parts and primary syphilitic sores may resemble them so closely that unless one is alert and bears in mind the possibility of syphilis he is apt to treat the case as nothing *out of the common.* Probably undiagnosed digital chancres are responsible for more syphilitic tragedies than any other class of primary lesion, and it is a wise plan always to be suspicious of sores about the fingers and thumbs, especially indolent ones. This is particularly important

in patients whose occupation brings them intimately into contact with the virus of syphilis, such as doctors, dentists, midwives, hospital attendants generally and, one might add, policemen, who are often brought into rough contact with syphilitic persons.

Glandular swelling does not greatly assist the diagnosis unless the gland is punctured for a microscopical examination, since it is common enough in septic affections, and a primary syphilitic sore may be followed by suppuration of the glands concerned. I once innocently lanced an epitrochlear bubo following what appeared from all accounts to have been a very ordinary type of sore on the index finger. A Wassermann test, which was undertaken as a precaution in view of the patient's occupation (laboratory attendant), revealed a partial positive, which led to puncture of a swollen axillary gland and discovery of the spirochæta pallida in the gland juice.

The microscope is the safest aid to early diagnosis, and the microscopical examination should be repeated more than once when the spirochætes are not found the first time, since these sores have usually been soaked in antiseptics, which kill off the spirochætes near the surface. In cases of failure to find spirochætes in the sore, a specimen from an enlarged epitrochlear or axillary gland should always be taken as soon as practicable.

Syphilitic eruptions of the hands and feet occur in all stages of syphilis, but perhaps more frequently in recurrent cases than early. They are found practically always on the plantar and palmar surfaces, and in the early eruptive stage are usually bilateral. At a later date they tend to be confined to one hand or foot.

The early eruption consists of a number of flat or slightly raised, dull-red spots which vary in size from a split pea to a sixpence. They are found especially on the thenar and hypothenar eminences and in the hollow of the foot. The individual spots, though barely raised, can be felt below the epidermis. The lesion scales quickly and leaves the shining

red papule surrounded by a fringe of greyish white, slightly raised epidermis The papules may run together to form large plaques, which are dry rough, and scaly and often traversed by painful weeping fissures.

Sometimes the papules become converted into small, whitish masses of hypertrophied epidermis, which are well imbedded in the skin, like little corns. The remains of the red papule may or may not be seen around the margin of such a corn, and this again may be surrounded by the fringe of loosened epidermis mentioned above.

Between the toes the papules are moister and covered with sodden epithelium, or only a fringe of this is left at the margin of a pinkish red moist erosion, which occupies the opposite faces of the affected digits.

In later stages of syphilis the papules tend to be grouped rather than scattered the grouping being as in other parts of the body in rings or discs. *The nodular or tubercular syphilide* may occur in one or more patches, which spread in a circinate manner centrifugally until the whole palm or sole may be affected. The edge of the lesion is occupied by a line of confluent, well imbedded papules, which are scaly or slightly incrusted on their surface this may be superficially ulcerated as in other nodular syphilides. The wake of the process is occupied by an area of thickened scaly epidermis.

Diagnosis.—On account of their greater tendency to scale, syphilides of the palm and sole may be confused with ordinary psoriasis. Their tendency to weeping and incrustation may also cause them to be confused with palmar eczema.

From ordinary psoriasis they are distinguished by the following In syphilis a careful search will usually disclose typical lesions elsewhere, and the psoriasis-like scaling may be confined to the palms, whereas in true psoriasis equally scaly patches can usually be found elsewhere, especially on the extensor surfaces of the joints. If the affection were confined to one palm or sole and spread

from it on to the dorsum, it would be evidence in favour of syphilis. Naturally syphilis might be suspected from the history in a patient who was also subject to psoriasis, and in the absence of definite signs of syphilis elsewhere it might be a matter of difficulty to determine whether the palmar or plantar portion of the eruption were syphilitic or otherwise. In the case of syphilis a strong Wassermann reaction would probably assist by showing that the patient was at any rate suffering from this disease, and the consequent anti-syphilitic treatment would clear up any plantar and palmar syphilides. In making use of the Wassermann test, it is well to remember that cases of psoriasis tend to give a positive reaction. The reaction is never definitely positive in well-graded tests, but it is often not completely negative, so that for diagnostic purposes a strong positive only would be accepted as evidence.

From **eczema** the syphilide is distinguished by its greater hardness and the circinate nature of its border. If only one palm is affected, the evidence is rather in favour of syphilis, though early syphilides are bilateral. If not, and, in addition, the lesion has spread from the wrist, while there are definite patches of unequivocal eczema elsewhere on the body, eczema is indicated.

Seborrhoeic eczema, though rare on the palms and soles, should be remembered. It is not so infiltrated as the syphilide, and is much more superficial, while it usually itches, and patches of seborrhoea will usually be found on other parts of the body.

Dysidrosis or cheiropompholyx should cause no difficulty. The disease is confined to the hands and feet, which are reddened and sometimes swollen, with a slightly burning feeling. The individual lesions are deep-seated vesicles below the epidermis, like sago grains, and particularly affect the palms and digital clefts. There is no superficial scaling as in syphilis, and if a few vesicles become confluent to form a bleb which breaks, the exposed rete is not infiltrated. The absence of signs of syphilis

elsewhere on the body should serve to complete the exclusion of the latter disease.

The NAILS are rarely affected in syphilis, and then chiefly in recurrent forms.

Syphilitic affections of the nails are divided into those in which the nail itself is chiefly affected, **syphilitic onychia**, and those in which the process commences in the surrounding structures, **syphilitic perionychia**.

The following forms of **onychia** are described (1) The nail becomes dull and brittle, tending to split easily and with its surface furrowed The free edge is thickened, and the skin under it thickened and scaly The nail may be pitted in parts and in parts thinned. (2) A papule forms under the nail, which appears first as a dull red, and later as a yellow spot the nail separates. Taylor describes a form in which instead of the papule seen through the nail, an opaque spot forms, over which the nail necroses locally leading to the formation of a pit down to its bed. The papular form of onychia seems to be commoner than the first-described form. Usually only one nail is affected, but Taylor describes cases in which two or more showed these changes. (3) The nail is greatly thickened in parts, where it is thrown into rough ridges. (4) The growth of the nail is arrested at its base, and the filberted nail of Jonathan Hutchinson is produced or complete arrest of the regenerative processes results, so that the old nail shows a gradually extending red surface at its base, which spreads until the nail is, as it were pushed off (5) Longitudinal striations in the nails are described by Heller

The following forms of **perionychia** are described (1) *Around* the nail the tissues are thickened and scaly while the nail itself becomes rough and irregular with transverse furrows. Sometimes ulceration follows, spreading to the nail bed, and resulting in loss of nail. (2) Suppurative perionychia, in which there is a diffuse reddening, with swelling of the ends of one or more fingers or toes. A

condition of ingrowing nail usually results owing to the pressure of the edge of the nail into the swollen tissues around, and the margin may show fungating granulations. The nail bed is ulcerated, and there is an accumulation of foetid pus there.

Though uncommon, syphilitic affections of the nails are important since they may be the only sign of syphilis which the patient discloses. In the cases seen by the writer there was no difficulty about the diagnosis since the colour of the swollen finger ends, especially at the margins of the nails, suggested at once an enquiry into the history. Under treatment, the prognosis as to restitution of the nail is good, although the nail remains for a long time deformed.

Syphilitic dactylitis, a gummatous osteitis affecting one or more phalanges, especially the proximal, shows itself in acquired syphilis from two years after the appearance of the primary sore. It consists in a quiet, painless swelling of the affected phalanx, which usually runs a slow course, although in earlier cases it may be more rapid in evolution. The skin and tendon sheaths are not affected at first, and the tendency is for absorption of the process to occur in time. Sometimes a sinus forms, through which the contents of the broken-down, gummatous process are expelled, and the result may be rarefaction or permanent thickening of the bone. In some cases the whole bone may be absorbed without the formation of a sinus, and the result is permanent shortening of the affected digit.

Diagnosis.—The diagnosis from **tubercular disease** may be difficult, and in certain cases the two processes may be combined in one phalanx. The presence of tubercle in other parts of the body with the absence of syphilis, and *vice versa*, assist, while the skiagram shows that in syphilis the process is confined in the earlier stages to the shaft.

Enchondromata are harder than gummata, and do not tend to soften and break down.

CHAPTER IX

THE HEAD AND NECK

The affections of the head and neck, including the mouth and throat, which owe their origin to venereal diseases are syphilitic and gonococcal, and may be considered regionally under the headings of (1) The Head and Neck generally (2) Nares, (3) Mouth and Throat, (4) Eyes, and (5) Larynx.

The only *gonococcal affections* which need be considered are those of the tempero-maxillary and cervical articulations and of the eyes.

Syphilitic Affections of the Head and Neck

Chancres are similar to those of the skin elsewhere. In men the beard may hide the characters of the sore, and the crusting of discharge on the hairs lead to it being mistaken for sycosis. The fact that the lesion is more localised planted much more deeply feels like a definitely circumscribed lesion, and is accompanied by painless enlargement of the submaxillary glands should cause a search to be made for the spirochæta pallida.

Glandular Enlargement.—A large, *painless, unilateral*, glandular swelling may afford a valuable clue to the presence of a primary syphilitic sore in the area drained, which might otherwise escape notice. Thus, enlarged submaxillary or submental glands, or both, may give the clue to the presence of a primary syphilitic sore within the mouth, and a prominent preauricular lymph gland calls for a close examination of the nasal, ocular and temporal regions.

Plate IX.



Syphilitic leucoderma.

Glandular enlargement immediately preceding and accompanying the outbreak of the first rash can be made out, when it occurs, in the posterior triangles more easily than elsewhere, but the preauricular temporal, occipital, and other glands of the head and neck may also be enlarged and distinctly palpable.

Leucodermia (Plate IX) —As a sequel to a syphilitic roseolar eruption which may have passed unnoticed, or without this as antecedent a peculiar change in pigmentation often occurs which remains for many months as a sign of great diagnostic value, when other signs may have disappeared. The condition is known as **syphilitic leucodermia.** It is found most often on the necks of dark haired women, and occurs in two main forms (1) A broad band of pigmentation around the neck and (2) a broad network of deeply pigmented skin surrounding irregular light areas. The contrast between the light and dark areas produces a dappled appearance which is diagnostic of syphilis. As a rule, it affects the back and sides of the neck, but occasionally spreads down to the axillæ, and in a few cases it has been found fairly generalised. It is best seen when the neck is slightly in shadow It is not so frequent in men as in women, but occurs much more often in the former than is generally taught.

Diagnosis —Syphilitic leucodermia is distinguished from vitiligo, the chloasma of pregnancy Addison's disease, and arsenical pigmentation by being confined in almost all cases to the neck area. In vitiligo the white patches are larger and are not surrounded by a network of more deeply pigmented skin. In Addison's disease there are characteristic constitutional symptoms and patches of pigmentation in the mouth. Arsenical pigmentation is accompanied by other signs denoting the taking of this metal, and the rain-drop appearance is characteristic. The chloasma of pregnancy is seen better on the face, especially about the eyelids.

Syphilitic eruptions in all respects similar to those found

elsewhere occur anywhere on the face, though not so frequently as on the trunk. The commonest situation of the maculo-roseolar or papular syphilide is the forehead, where a line of macules or flat papules (corona veneris) is often found at the margin of the hairy scalp.

In patients with greasy or seborrhoeic skins, the early papular eruption often differs from that found on the trunk at this time in the fact that the papules run together to form pinkish red or brownish yellow slightly raised rings (Plate X) similar to those often found on the scrotum (rarely two concentric rings occur). In other cases the eruption is arranged in little clumps of closely set, but discrete, papules. Both annular and grouped arrangements are found especially about the naso-labial folds, on the nose, about the angles of the mouth, and on the chin. It will be remembered that the grouped and ring-like distributions of papules on the trunk are characteristic of recurrences rather than early syphilides, but on the face they may be an early feature.

At the angles of the mouth and the junction of the alæ nasi with the upper lip, as well as sometimes the entrance to the auditory meatus, the syphilitic lesion may be traversed by cracks or fissures from which serum oozes freely and dries to a crust. In these situations, too, they may be more prominent than on the face generally approaching more closely to the condylomatous type of lesion.

The eruption may be vesicular or pustular as described elsewhere, and the resultant crust very prominent. It is easy to find spirochætes in any of these syphilides, and this, with their colour and distribution, simplifies the diagnosis.

Alopecia.—Examination of the scalp in the secondary stage of syphilis often shows the characteristic alopecia of syphilis, in which the hair of the beard and eyebrows may also take part.

The most noticeable form of alopecia is that in which the hair falls in irregular patches, and the back of the



Annular syphilide of face.

scalp assumes a moth-eaten appearance. If many patches coalesce, large bald areas may be produced which are distinguished from the patches of alopecia areata by being generally more numerous, and not so smooth as in areata, and in the absence of the "notes of exclamation stumps" which are found in the latter

Besides this form of alopecia the patient may be afflicted with a general thinning of the hair This is more likely to be noticed by women, who naturally pay much more attention to the amount of hair they find in their combs. Most of the hair may be lost and the patient become bald, but this is rare. In recurrent syphilis the scalp often shows comparatively large crusted areas under which there may be superficial ulceration. The outlook for recovery of the hair is good in the alopecia of early syphilis, but the later syphilides often leave permanently bald patches from destruction of the hair follicles.

Later Syphilitic Lesions.—In later stages of syphilis, rupial, nodular and gummatous syphilides have the characteristics already described. In the absence of other signs of syphilis it may be necessary to diagnose them clinically from certain non-specific lesions which favour the face so that the main points which are useful to their diagnosis may be repeated.

Syphilitic rupia (fig 10, p 80) is distinguished from ordinary impetigo and other crusted affections of the skin of the face by the dark, laminated or limpet-shaped crust, and the underlying ulceration.

The nodular or tubercular syphilide as it appears on the face favours the forehead nose and region of mouth. It generally shows the segmented, or circinate, slowly advancing border of well-imbedded nodules, leaving in its wake the superficially cicatrised, pliable areas already described (p. 91). Sometimes the nodules are aggregated into a small group

There is a greater tendency here to ulceration of the nodules, with formation of crusts, and the latter often

become heaped up in the rupial manner Sometimes the underlying tissues proliferate more than usually and the result is a number of prominent, moist, ulcerated warty outgrowths like raspberries or pieces of pickled cauli flower (**framboesiform syphilide**)

When the gummatous process commences in the under



Fig 24 Gummatous ulcer root of nose, exposing nasal bone

lying tissues, perhaps spreading to the skin from the bones of the face the ulceration is much deeper and the resulting deformity greater (figs. 24 and 81) The skin and cartilage at the entrance to the nose may be eaten away and as there is generally considerable destruction of the arch of the nose, the whole nasal cavity may be laid bare. Fortunately

these severe ulcerations are now rare, and can be rapidly stopped in their commencement, so that there is small chance of our seeing much of the terrible mutilation and disfigurement which were once comparatively common.

Gummata of the frontal and parietal regions are fairly common (fig. 25). A smooth swelling forms at first, which



Fig. 25. Gummatous ulceration of frontal and parietal regions.

soften in the centre and a rampart of sclerosed bone is built up around it. Unless treatment stops the process, the skin gives way and an ulcer is formed at the bottom of which bare worm-eaten bone can be felt, and the free edge of skin becomes adherent to the margin of the ulcer. Two or three gummata often appear close together and the ulcers then run together to form a clover shape or a

number of gummata may encircle a comparatively large area of enclosed bone, which necroses. In other cases, the gumma outside coincides with one starting from the inner table, or from the meninges, and the two cause a perforation by meeting As a rule in these cases, the remainder of the cranial cavity is cut off by adhesions, but cerebral symptoms may occur according to the amount of pressure exercised by the inner gumma, or at a later date from the sepsis which accompanies the outer ulcer

Diagnosis —The later syphilitic affections of the head and face resemble in some respects certain other lesions, from which it is necessary to distinguish them. The chief of these are lupus, rodent ulcer epithelioma, lupus erythematosus, and much more rarely malignant pustule and actinomycosis.

Lupus patients give a history of the growth having progressed very slowly The ulceration is much more superficial, and beyond the irregular edge of the main process may be seen the apple-jelly nodules. The cicatrix left by lupus is denser and more scar like than that which follows a nodular syphilide, which is soft, supple, and more like skin. Apple-jelly nodules are often left in the lupus scar The patient s age and family history may assist, since lupus generally makes its appearance for the first time when the patient is still quite young and he or his family may be tubercular The syphilitic patient may be much older obviously robust, and have never had an ulcer on his face before. A history of syphilis with a positive Wassermann reaction may then clinch the matter but here, as in other cases, it is well to be on guard against attaching too much importance to history and the Wassermann reaction for the diagnosis of one particular lesion.

Rodent ulcer favours the upper part of the face, while a syphilitic ulcer may occur anywhere. The margin of the rodent ulcer is not clean cut, but tends to be rolled. The discharge is slight in comparison with that from a syphilitic ulcer and the history frequently shows that for a long

time before the ulceration appeared there was a wart which grew very slowly. This contrasts with the case of syphilis, in which the first appearance of a blemish on the face is quickly followed by ulceration with crusting, and this follows a line which is a segment of one or more circles. The age of the patient may assist, and the presence or absence of other signs of syphilis about the body.

Epithelioma is distinguished by the edges being rolled over everted, and very hard, not clean-cut and segmented, as in syphilis. In the margin of the epitheliomatous ulcer may be found the characteristic plugs of epithelium. But any doubt as to epithelioma or rodent ulcer should be

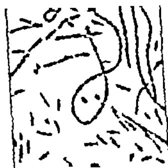


Fig. 26. Anthrax bacilli, showing spores. (Muir and Ritchie.)



Fig. 27. Actinomycosis. (Muir and Ritchie.)

settled by having a section cut and examined. One or two doses of salvarsan or similar preparation would decide in a week if the process were syphilitic.

Lupus erythematosus usually sits astride the nose and adjoining cheeks like a butterfly, and similar lesions are commonly found on ears and hands. Its edge is well defined, but not infiltrated and nodular as in syphilis, and the scarring which is left by the non-specific lesion is hardly noticeable. The patient is usually of the type which suffers easily from blue fingers and chilblains. The presence of patulous and plugged sebaceous openings favours a diagnosis of lupus erythematosus.

Malignant pustule would be suspected from the acute history the central black eschar surrounded by kidney shaped vesicles and angry areola its intense itching and perhaps the patient s trade. The diagnosis is confirmed by microscopical examination of the exudate, which discloses the anthrax bacillus (fig 26)

Actinomycosis is fistulous, and the orifices of the sinuses pouting The area involved is puckered and the golden granular discharge contains the ray fungus (fig 27) It is usually found pointing in the submaxillary and submental regions.

GONOCOCCAL AFFECTIONS — *Arthritis of the temporo-maxillary* **joint** is not difficult to diagnose. The fixation of the joint, association with gonorrhœa, and in most cases, arthritis of some other joints point clearly to the nature of the affection. It may be many weeks before the patient is able to open his mouth completely In the case of the **cervical joints**, discomfort, stiffness, and creaking may have their origin in a urethral infection.

LESIONS OF THE NARES

Primary syphilitic sores are so uncommon inside the nose that they are apt to be overlooked until secondary signs make their appearance. An indolent, raised and indurated sore at the entrance to the nares, and one which has grown to prominence in a week or two, should be searched for spirochætes, particularly if there is also enlargement of the corresponding submaxillary or the preauricular lymph glands. I once diagnosed a chancre of the inferior conchate bone by scraping the mucous membrane over its anterior margin and finding Sp pallida in the serum and blood which exuded. The mucous membrane was swollen and dark red, and there had been considerable enlargement of submaxillary lymphatic glands on the same side, which was then subsiding This comparatively rapid enlargement of submaxillary glands should

have aroused the suspicion of syphilis and caused a search to be made for a focus some weeks earlier

Secondary lesions of the nares do not give rise to any very characteristic signs in acquired syphilis. There may be some slight catarrh, but this is not a prominent sign in adults and generally passes unnoticed. It is a more striking symptom in infants (p 210). Sometimes in conjunction with similar lesions elsewhere, moist papules are found at the junction of the alæ nasi and lip.

The later syphilides of the nares are much the most important, since, unless they are recognised and promptly treated, considerable deformity may result. Prompt action should always be taken when a patient who is known or suspected to have contracted syphilis complains of a chronic cold and feeling of stuffiness, as these may be the only signs of serious trouble before the bridge of the nose falls in, or the hard palate is perforated. Sometimes the patient complains of neuralgic pains, which are referred to the nose, forehead, or over the head generally and are worse at night. The end of the nose may become bulbous, or the eyelids and face swell, and there may be tenderness on pressure over the bridge of the nose.

The patient is continually blowing his nose and clearing out blackish or green scabs, which have an offensive smell. Eventually pieces of bone may be blown out, or half swallowed and hawked out of the throat, and the odour of the nasal discharge becomes so offensive that the patient has to shun society Any of these signs should stimulate an investigation of the interior of the nose and the Wassermann reaction of the blood. A positive reaction in conjunction with the slightest signs of intra nasal disease indicates treatment without any delay

The commonest area to be affected in tertiary syphilis of the nares is the lower and anterior part of the septum and the vomer but any other may be involved. The mucous membrane is swollen, and does not collapse on the application of cocaine, adrenaline, or hemisine, and the

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loss of its support. Sometimes the cartilaginous septum suffers alone, and the tip of the nose falls in. More commonly especially in inherited syphilis, the bony arch sinks and broadens (fig 28), partly from loss of its support, and partly from cicatricial contraction of the tissues within the nose, and the result is the saddle-nose. Loss of the nasal bones results in the arch sinking still further becoming almost flush with the face. If this is combined with loss of the cartilaginous septum, the whole nose lies flat against the face, with the nostrils practically vertical. The gummatous ulceration may break through the skin of the face and cause spreading ulceration of the face, as already mentioned.

Diagnosis.—Late syphilitic lesions of the nose have to be diagnosed from *lupus and from malignant disease* as well as *atrophic rhinitis* with its accompanying ozæna.

Lupus is a much slower process, and the ulceration much more superficial, while the discharge is scantier

Malignant disease is more painful the ulcerated surface bleeds more easily is more proliferating and accompanied by enlargement of glands. The patient's age, history and Wassermann reaction may also be against syphilis.

Atrophic rhinitis is distinguished by the absence of ulceration, and the covering of the inferior conchate bone is shrunken, not swollen.

SYPHILITIC AFFECTIONS OF THE LIPS, MOUTH, AND PHARYNX

Next to the genitals, these regions are the most important in the body from the point of view of diagnosis in syphilis. The mouth and pharynx are favourite sites for lesions in the secondary and recurrent stages of syphilis, especially in men. Syphilis favours most sites which are exposed to irritation and injury and men abuse their mouths with tobacco smoke and alcohol

interior of the nose may be found to be extensively ulcerated When the ulcers are probed, bare bone is felt. The mouth should always be carefully examined in all these cases, and a dome shaped, perhaps reddened, swelling in the middle line of the hard palate, a little behind the incisors, or a bulging of the soft palate, is practically diagnostic of syphilis.

The consequences of neglected tertiary syphilis of the



Fig. 23. Saddle-nose the result of congenital syphilis.

nose are diverse. If the roof is attacked the meninges may be exposed and the patient die of meningitis. The commonest results are perforations of the palate and the nasal septum, and various deformities of the nose from

loss of its support. Sometimes the cartilaginous septum suffers alone, and the tip of the nose falls in. More commonly especially in inherited syphilis, the bony arch sinks and broadens (fig 28) partly from loss of its support, and partly from cicatricial contraction of the tissues within the nose, and the result is the saddle nose. Loss of the nasal bones results in the arch sinking still further becoming almost flush with the face. If this is combined with loss of the cartilaginous septum, the whole nose lies flat against the face, with the nostrils practically vertical. The gummatous ulceration may break through the skin of the face and cause spreading ulceration of the face, as already mentioned

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much more than women. The various syphilides of these regions are essentially the same as in other parts of the body according to the different stages of the disease at which they are found, but as they differ somewhat in clinical appearance according to their sites, the different parts of the mouth may be considered separately

THE LIPS —Primary chancre of the lip is commoner than almost any other extragenital chancre.

It is a lesion which may escape notice, when, as sometimes happens it is quite a trivial sore, or a crack which disappears quickly In other cases, where it is more prominent and crusted, it may be mistaken for a simple septic sore, for impetigo or perhaps epithelioma. The usual type of sore appears as a circumscribed mass on the free edge of the lip (Plate XI) which becomes more or less eroded or ulcerated but not deeply so unless it becomes septic. The surface of the erosion is slightly indented and smooth. It is crusted on the skin side, more obviously ulcerated on the moist side, and around the erosion is the usual pinkish red or bluish areola covering an indurated area. The whole lip becomes heavy and thickened, and when the lower lip is affected the eversion is often very marked The submaxillary and posterior cervical lymphatic glands are usually enlarged early and often become visibly prominent. Sometimes they suppurate, since the primary sore is very liable to secondary infection.

Diagnosis —All indolent sores about the lips should be looked on with suspicion from the point of view of syphilis and the best positive evidence of syphilis here, as elsewhere, is the presence of the spirochæta pallida in the sore exudate or the gland juice. The specimen should be taken from the outer margin, to avoid contamination with saliva.

Impetigo should easily be excluded by its superficial nature, the presence of similar lesions elsewhere, and by the absence of induration, or thickening of the lip

Epithelioma has a more ragged irregular surface, and

Plate XL



Chancre of lip

bleeds easily as chancre does not. It develops much more slowly and the glands are not enlarged so early as in syphilis.

Secondary Lesions—Mucous Patches.—In the secondary stage it is common to find inside the lips and sometimes spreading from this over the free margin, one or more raised syphilitic papules, called here mucous patches (Plate XII) They are greyish-white or red, slightly raised plaques, which are rounded or oval, and of any size from a split pea to a shilling or bigger If the patch is greyish white, it is usual to find around it a narrow areola which is pinkish red, not angry looking as in the case of septic lesions.

In some cases the macerated epithelium covering the lesion has been removed by friction, and the whole patch is then the colour of th areola mentioned above contrasting well with the surrounding mucous membrane. When the papule preads over the free margin of the lip the part which is exposed to the air becomes crusted.

Mucous patches of the lip are not usually painful except where they cross the angle of the mouth or the middle of the lip. Here the stiff inelastic papule is exposed to stretching and cracks, producing a painful fissure When situated at the angle f the mouth the mucous patch is naturally found on contiguous sides of the lips, and traversed at the angle by the fissure just mentioned.

Mucous patches f the lips are easily recognised by the features described, and the diagnosis is clinched by microscopical examination, which usually results in the finding of swarms of specific spirochætes. **Septic lesions** are more excavated and edged by a bright red line.

In later stages of syphilis, a **nodular syphilide** may appear on one or other lip. Like other late syphilides of the lips and mouth, it may become phagedenic, and very extensive destruction of the lips occur before the process can be stopped (fig. 20).

Gummata of the lip may be diffuse or localised, like most gummatous processes of mucous membranes. In the

former case the whole lip becomes enlarged, everted, and ulcerated When the gummatous process is more localised, one or more nodules appear in the substance of the lip, and

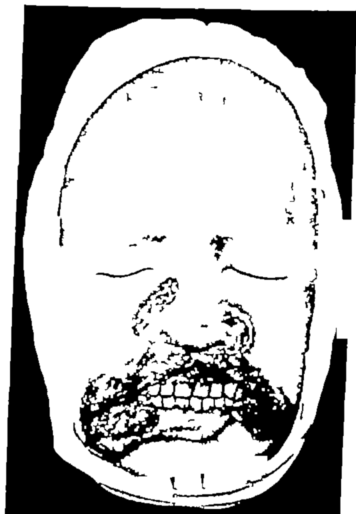
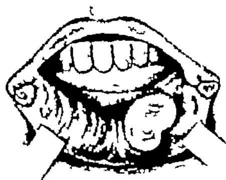


FIG 29 Syphilitic ulceration of lips which has become phagedenic.

reaching the surface give rise to an ulcer with clean-cut, segmented edges which are not particularly hard. It is distinguished by these characters from a carcinomatous process, with its rolled-over everted edges, which are hard

PLATE XII



Mucous patches on the lower lip and at both angles of the mouth, those in the latter situation traversed by fissures.

and contain epithelial plugs. A gumma is distinguished from primary sore, apart from the history by being cut out and having no rampart of induration around it. In cases of doubt, numerous spirochæta pallida would be found in the secretion from a primary sore while the finding of even one or two in a gummatous ulcer would be a rarity

On the insides of the cheeks mucous patches similar to those just described may be found and occasionally they may be ring-shaped. They are not to be confused with the small yellow spots of **Fordyce's disease.** These are pin-head spots which are yellowi h and set n rows apparently under the mucous membrane They are n no way like mucous patches, being m ch smaller and covered by intact, not macerated ep thelium They often occur in patients who have suffe d from syphilis, but should not be diagnosed as recurrences to the unnecessary distress of the patient.

Herpes sometu occurs insides the cheeks, but its diagnosis will be con idered connection with lesions of the tongu a t not lik l to cause any confusion here.

Aphthous patches ar d tinguished from syphilitic lesion l y being y ll w rati er than gre or red. They have angry re l n gi s, and are painful

In mercurial and other stomatitis, an ulcerated, whitish patch or pat l s ay be seen on th cheek and on the gums where th in argin adjoins, and ften overhangs, the last mola t th Th y are apt to be taken for recurrences of yph l but ar d ting hed by their angry red n rgins, th t d nes and the other sign of stomatitis n th th or f Vincent angina. If the patient n actu ll l r se ual and mercurial treatment at the t n f th r t appearance t i saf to exclude syphilis on th gr l al ne s nce I have never seen a mucous pat h make t f rst appearance in the mouth of a syphilitic patie t wh l nder th modern combined treatment, though the w re com mon enough under the purely mercurial régim

Dermatitis herpetiformis and Erythema multiforme in their bullous forms may attack the mouth and cause lesions which are similar to mucous patches. If no bullæ or other signs of these diseases are found on the skin, the diagnosis may be made by the more definitely inflammatory appearance of the patches and the absence of the spirochæta pallida or other signs of syphilis.

In later stages of syphilis, it is common to find a patch of leucoplakia covering a variable portion of the cheek. It generally extends as a bluish white ribbon of tough mucous membrane from the angle of the mouth along the line of the teeth to the last molar The band is cut up by furrows, herring bone fashion, and is easily recognised by its distinctive appearance.

The TONGUE probably suffers more from syphilis than any other part of the mouth, and the lesions are characteristic. They are important also, because some of them are very apt to be followed by carcinoma.

Primary chancre of the tongue is generally treated for something else until the secondary rash appears and gives a clue to the diagnosis. It is found most often on the dorsum, near the tip, or on the tip itself, as a round or oval sore, which is brownish red or covered with a membrane. Standing well up from them it contrasts boldly with its surroundings The surface is eroded, but if the sore is secondarily infected, the ulceration may be deeper The surrounding induration mats the whole lesion together till it feels like a foreign body in the soft tissues around it. Enlargement of the submental glands, coupled with the fairly rapid evolution of the sore, should give the clue to the diagnosis, and lead to a microscopical examination.

Diagnosis —Epithelioma occurs more often on the sides of the tongue and has a much more irregular surface with rolled edges which bleed easily it is painful and leads quickly to fixation of the tongue. The patient is usually old in carcinoma, though naturally a patient of any age may contract syphilis. Tubercular ulcer is

irregular in its contour has steep, undermined edges, and is not indurated, but soft and flexible. It is very painful, and occurs, moreover in advanced tuberculosis.

The secondary lesions of the tongue vary in their clinical appearances with their position, which determines the friction and stretching to which they are exposed. Mucous patches occur comparatively early *On the sides of the tongue* especially in patients who are solely on mercurial treatment, it is common to find grey linear and circular syphilitic erosions or ulcerations following the furrows, which catch the eye at once when the patient thrusts his tongue into one cheek or out towards one ear They are found most often in relapse cases of six months duration or longer Often they are accompanied by a large patch of leucoplakia, which surrounds them. They should not be confused with herpes.

On the dorsum of the tongue it is common in syphilitic recurrences to find smooth, red patches where the filiform papillæ have been rubbed away The patch looks as if it had been rubbed down with pumice stone and contrasts sharply in its smoothness and deep-red colour with the surrounding mucous membrane. On the dorsum of the tongue behind, as well as on the under surface, the syphilitic papule may be condylomatous, contrasting with the surrounding tissues in its prominence and greater whiteness.

Diagnosis —Crops of herpes are common on the tongue of patients who are suffering from syphilis, and since one always looks with suspicion on any lesion at the side of a syphilitic patient s tongue, herpes is often mistaken for a syphilitic recurrence. Herpes is not affected by antisyphilitic treatment, and the patient suffering from it may become greatly depressed if recurrence is diagnosed, as he may naturally think that the treatment is not having the desired effect. In herpes the lesion consists of a group of minute vesicles, which have generally broken, leaving very superficial lesions, by the time the patient makes his appearance. Close inspection, however shows

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with that of the original process (fig 30) The bald islands are generally covered with a bluish-white pellicle, which may be thin enough to show the red surface underneath, or is more definitely leucoplakic. The furrowing is



Fig 30 Syphilitic glossitis with leucoplakia inherited syphilis.

best seen when the patient is made to thrust out his tongue to its fullest extent, when the manner in which the furrows open out, sometimes disclosing deep ravines in the tongue, is very characteristic.

Localised gummata of the tongue may be associated with diffuse infiltration or occur alone. They are painless

that the border is made up of segments of a number of minute circles, round each of which may be seen a tiny collar of loosened epithelium. It may be possible to find in the neighbourhood a few unbroken vesicles which are typical of herpes, and the patient may give a history of some neuralgic pains in the tongue before he discovered the sores. He may also be able to say that similar crops appeared and disappeared before, without any special relation to treatment. This fact, with the minute size of the individual lesions, should be sufficient for the diagnosis.

Glossitis exfoliativa marginata, or wandering rash of the tongue may be mistaken for a syphilide. It is distinguished by its fine white border which is regularly curved or gyrate and constantly changing its position.

In later stages of syphilis the tongue may be strikingly affected. **Leucoplakia** of the sides has been mentioned in connection with recurrent ulceration. It often affects the dorsum, and generally in conjunction with syphilitic glossitis. The affected mucous membrane is thickened, inelastic, and milky white. Although it is usually a comparatively late manifestation of syphilis, leucoplakia may occur during the first year It is said that it is not invariably the result of syphilis, but the cases in which syphilis can definitely be excluded must be very rare.

Syphilitic glossitis is counted as a lesion of the tertiary stage. It consists in a diffuse gummatous infiltration of the tissues of the tongue, which may be submucous only or considerably deeper and the whole tongue may be affected or only portions of it. The affected portions become enlarged smooth, and bald and the whole organ may become so large that the mouth cannot close upon it. The tongue is harder than normal, feels sore when touched, and the patient is intolerant of spices and hot food. Sooner or later the process begins to retrogress, and the tongue becomes characteristically lobulated, being cut up into islands surrounded by fissures, the depth of which varies

A patch of leucoplakia may be mistaken for a mucous patch, but is denser tougher more bluish than greyish-white, and crossed by furrows.

Gummata have to be distinguished from simple and malignant tumours.

Simple tumours are well-defined, elastic, and often lobulated. They are generally single, while gummata are usually multiple.

Cancer of the tongue occurs late in life, while syphilis may occur comparatively early Cancer feels painful and interferes considerably more than gumma with the movements of the tongue. Gumma prefers the dorsum of the tongue, while cancer is usually found at the sides. The edges of the cancerous ulcer are not clean cut, but irregular very hard, and everted. The history may assist very greatly since in the cancer case there may be a story of chronic irritation from a tooth or other cause for years before a hardness developed. The gumma story would be of a lump which was found perhaps by accident, and was at first covered by quite intact mucous membrane.

It would be very unwise, however to exclude cancer on the score of a history of syphilis, or because the lesion in question was proved to be syphilitic, since cancer is often engrafted on syphilitic lesions of the tongue, especially leucoplakia with ulceration and fissuring of the sides. Whatever the affection, whether it be a gummatous ulcer a fissure, or leucoplakia, if it becomes hard or fails to yield definitely to modern antisyphilitic treatment, the indication is to remove a piece of the margin and submit it to histological examination without delay

Tubercular ulcer is flatter and more irregular than gummatous; its edges are ragged, and it is much more painful. It could safely be excluded if the patient were robust, since it is associated with advanced tubercular diseases elsewhere.

The Fauces and Tonsils are important, as they are

and may first attract attention by interfering with the movements of the tongue or causing some swelling of it. This may be due to the new growth itself, or to pressure on the ranine vein and lymphatics. If seen before they have come to the surface they are felt as ill-defined nodules in the substance of the tongue. The nodules are not lobulated in any way though two or more gummata close

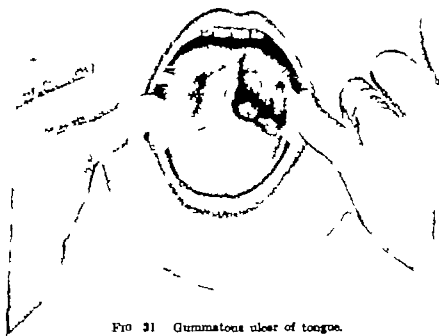


FIG 31 Gummatous ulcer of tongue.

together may give a false impression of lobulation. The mucous membrane is unaltered unless interstitial glossitis coexists but as the gumma comes to the surface and projects, the covering becomes brownish red breaks in the centre, and the typical crateriform tertiary ulcer is formed (fig 31) The fusion of a number of ulcers from gummata opening on the surface may cause very extensive destruction of tissue, especially if the gummata originated very deeply

process may be fairly deeply ulcerated, but the margin usually shows the mucous-patch appearance described above. In other cases the covering of the patch is much denser and resembles a diphtheritic membrane.

Diagnosis.—The appearance of a mucous patch on the fauces, etc. is usually characteristic enough to obviate any difficulty in diagnosis, but it is quite common for other lesions which are associated with a greyish covering to be diagnosed syphilis, and *vice versa*. The apparent inconsistency between extensive throat lesions and the absence of any commensurate discomfort or constitutional symptoms is always suspicious of syphilis. The quiet, pinkish-red areola which is sharply defined on the side of the normal mucous membrane and the fact that here the lesion is not punched out are also characteristic. A microscopical examination of the exudate easily reveals numerous spirochæta pallida.

When the maceration of the covering epithelium is more pronounced, so that the white portion is denser, it may be mistaken for diphtheria. Apart from the presence of other signs of syphilis elsewhere, the diphtheritic membrane can be loosened more easily at its edges and the denuded surface bleeds more freely. A microscopical examination should settle any doubt, and is another argument for the microscopical examination to be carried out on the spot. Since diphtheria bacilli can be stained in the course of about five minutes, or spirochæta pallida found in another ten minutes, counting the time taken to change the substage condensers, the decision as to diphtheria or otherwise is not one which should wait until a specimen has travelled to a laboratory and the result received in the course of two or three posts.

Vincent's angina, in which the tonsils, fauces, and perhaps the soft palate are ulcerated and covered with a false membrane, is often diagnosed syphilis, since the discomfort and constitutional symptoms in Vincent's angina may be so slight as to be unnoticed by the patient.

commonly the seat of syphilitic lesions when other parts of the body are free.

Chancre of the tonsil is usually mistaken for tonsillitis, if it is noticed at all until secondary symptoms appear A unilateral tonsillitis which is not associated with constitutional symptoms, or with pain to anything like the degree which one would expect from its appearance, should arouse a strong suspicion of syphilis if the glands at the angle of the jaw or under the middle of the sterno-mastoid are found to be painlessly enlarged, the suspicion is considerably strengthened The tonsil is large and projects well towards the middle line. The parts of it which are not covered with membrane are dark red, and the tonsil feels india rubbery hard There may be only a superficial erosion or owing to secondary infection, the ulceration may appear to be quite deep. The serum and blood obtained by lightly scratching the surface of a tonsillar chancre will be found to be teeming with specific spirochætes a point of some importance in the diagnosis from gummatous ulcer of the tonsil, if the history does not help

Even before the advent of the skin rash the fauces often show an **erythema** which is fairly typical. It spreads up over the fauces and covers the soft palate and uvula, leaving the hard palate severely alone. The appearance of such an erythema in a patient who was suffering from a doubtful sore would be suspicious, though one might hesitate about making a diagnosis on this sign alone.

Mucous patches are very common on the fauces, tonsils, soft palate, and uvula, especially in secondary cases which have relapsed or whose treatment has been neglected. They are often confluent, and spread as a greyish-white track up over the pillars and the margins of the uvula and soft palate. The mucous patch is bordered by a narrow pinkish red areola, which is flush with the surrounding mucous membrane. Sometimes much of the grey portion is rubbed away and the affected pillars have a patchy pink and grey white appearance. The centre of the

membrane over the swelling becomes red, and an ulcer forms, at the bottom of which bare bone is felt. If the gummatous process has started on the mouth side, it comes to the notice of the patient fairly early and he seeks advice before much damage has been done. Often, however the appearance of the swelling is the first sign

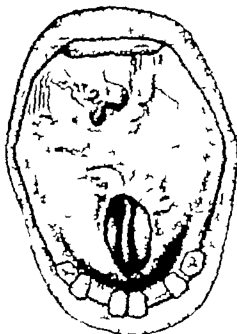


FIG. 34. Gummatous ulceration of hard and soft palate with perforation of the former

of an intranasal gumma having worked through the palate, and in this case the resulting perforation is usually a large one which will not close down (fig 34).

The **soft palate** may be implicated in diffuse gummatous infiltration, or a localised gumma may form in it. The patient's attention may be attracted to it before ulceration has occurred by regurgitation of liquids through the nose,

Vincent's angina is more frequently unilateral, the edge of the lesion is angry and undermined and it bleeds easily when rubbed with a swab. The spirochætes found microscopically under dark ground illumination are much coarser than spirochæta pallida, and fusiform bacilli abound in the specimen (figs 32 and 33)

It is hardly necessary to warn against mistaking a streak of mucus trickling down the back of the pharynx for a mucous patch. As a matter of fact, mucous patches hardly ever occur on the back of the pharynx, but the

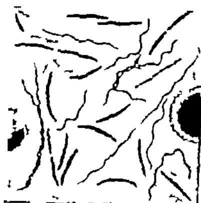


FIG 32 Fusiform bacilli and spirochætes found in Vincent's angina. (Muir and Ritchie.)



FIG 33. Spirochæta pallida. (Muir and Ritchie.)

tendency is to label every white patch in the mouth and throat as syphilitic, and I have known a case diagnosed as syphilis on the strength of a snail track of mucus stealing down the pharynx.

Tertiary lesions of the fauces and tonsils are more conveniently discussed with those of the palate and back of the pharynx.

Gumma of the palate is probably the commonest tertiary lesion of the mouth. It is often associated with a similar condition of the nose or naso-pharynx. When the hard palate is affected, a painless swelling appears in the middle line a little behind the central incisors. The mucous

membrane over the swelling becomes red, and an ulcer forms, at the bottom of which bare bone is felt. If the gummatous process has started on the mouth side, it comes to the notice of the patient fairly early and he seeks advice before much damage has been done. *Often, however the appearance of the swelling is the first sign*

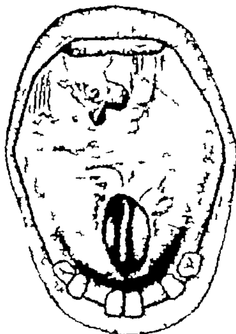


FIG. 31 Gummatous ulceration of hard and soft palate, with perforation of the former.

of an intranasal gumma having worked through the palate, and in this case the resulting perforation is usually a large one which will not close down (fig 31).

The soft palate may be implicated in diffuse gummatous infiltration, or a localised gumma may form in it. The patient's attention may be attracted to it before ulceration has occurred by regurgitation of liquids through the nose,

or a change in the voice, owing to the thickening and stiffening of the soft palate interfering with its movements at this time the palate may be seen to be bulging the chief trouble being in the naso-pharynx. Generally however the infiltration has already broken down when the patient makes his first appearance, and there may be one or more clean-cut perforations or extensive ulceration of the palate. The commonest site of a perforation of the soft palate is in the middle line, at its junction with the hard palate, but in addition to this there may be one or more perforations in other parts, and from any of these the ulceration may spread until a large portion of the soft palate and uvula is destroyed. If quite small and treatment is prompt and effective, the perforation may close in healing

Serpiginous ulceration of the soft palate may occur quite early in syphilis, the process coinciding with a nodular ulcerating syphilide. The ulcers are clean-cut, with a serpiginous outline, sloughing base, and surrounding purplish red halo. On healing they lead to the most extensive deformities, with dense white often radiating scars. A similar ulceration may attack the fauces, tonsils, and posterior wall of the pharynx. The soft palate may be united to the posterior wall of the pharynx, either partially or completely and produce more or less interference with the passage of air and the swallowing of food. There is hardly any limit to the diversity of deformities of the soft parts about the pharynx which may be produced by the adhesions and scar contractions resulting from gummatous ulceration.

The radiating white scars produced by tertiary ulceration of the soft palate and the white bands at the sides of the pharynx, with the deformity of the parts here, may be valuable indications of past syphilitic ulceration congenital or acquired, in cases where the history is vague.

Gumma of a tonsil may occur apart from any other lesion. After causing a painful swelling of one tonsil, it breaks down to a crateriform ulcer which may be difficult

to distinguish on its own features from other ulcerative lesions of the tonsils. The clean-cut margins of the ulcer and its sloughy base, with a definite history of syphilis, should however be sufficient for the diagnosis of most cases. The distinguishing features of other lesions, with which it may be confused, will be considered later

Gummata of the posterior pharynx may be single or multiple. A smooth, round swelling is followed by a typical tertiary ulcer which varies in depth and complications with the origin of the original gumma. If the latter commenced in the bodies of the vertebræ there is more or less spinal caries, and, rarely the process may spread to the cervical canal.

Diagnosis.—The diagnosis of late syphilitic ulceration of the fauces, tonsils, and pharynx is not usually difficult. One of the chief points which assist is the quietness of the symptoms in comparison with the magnitude of the lesion.

A quick appreciation of the significance of regurgitation of food, with a bulging soft palate, which may be reddened over the swelling, may sometimes prevent a perforation, when a "wait and see" policy may result in much subsequent misery and the same applies to swellings of the hard palate. A slowly progressing ulcer with thickened margin and sloughing base should arouse a suspicion of syphilis, although a very rapid one, complicated probably with phagedena, does not exclude it. In a case of gumma of the tonsil a suspicion of epithelioma may arise. The patient may be too young for epithelioma, and the epitheliomatous ulcer is not punched out like the gummatous. The rolled edges of the epitheliomatous process and the absence of any history or other signs of syphilis would favour malignant disease, though naturally the fact that the patient was suffering from syphilis would not exclude it. Absence of glandular enlargement favours tertiary syphilis.

Lupus is distinguished from tertiary ulceration by being more superficial and irregular the ulcer not being clean-

cut like a tertiary lesion. Lupus is almost certain to be associated with similar disease about the face and nose, and its rate of growth is about one-tenth that of the syphilide.

Actinomycosis might be suspected, and the simplest plan would be to examine the exudate microscopically for the ray fungus.

Glanders is a more acute disease and associated with far

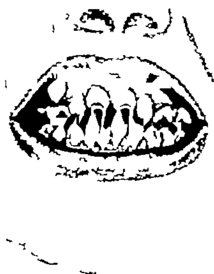


Fig. 35. Hutchinsonian teeth.

more constitutional disturbance. It would come into consideration only if the patient's occupation were likely to expose him to infection from horses or mules.

Tubercular ulceration has been mentioned in connection with the tongue and the same distinguishing points apply

It may be a matter for speculation whether the tonsil is involved in a primary chancre or a tertiary ulcer. As a rule, it should not be difficult to arrive at a conclusion from

the patient's age, and history as well as the characters of the different lesions, but in cases of doubt the discovery of numerous spirochæta pallida in the exudate, and enlargement of neighbouring glands would settle the diagnosis in favour of the earlier lesion.

Evidence of past or hereditary syphilis is often found in the mouth and throat which is of great value in piecing together facts in the patient's history. Perforation of the hard and soft palate naturally indicates past syphilitic ulceration, which may be congenital or acquired. The same applies to radiating white scars and deformity of the soft palate, as well as white, band like scars running up the pillars of the fauces to the soft palate scars on the



FIG. 36 Hypoplastic teeth; not necessarily syphilitic.

back of the pharynx, and adhesions between the soft palate and posterior pharyngeal wall. The decision as to whether the past syphilis was congenital or acquired would depend largely on the history of the patient and that of his parents, as well as other signs about the body.

The TEETH may show valuable evidence of congenital syphilis. The most frequently and characteristically affected are the upper central incisors (fig 35) more rarely the lower central incisors show the same features. The affected teeth are widely separated from one another and from their neighbours, have wider bases than cutting edges, and the corners of the cutting edges are rounded off, while the centre of the cutting edge is occupied by a crescentic notch. Teeth with these characters are

Hutchinsonian teeth, and are diagnostic of congenital syphilis. By no means all congenital syphilitics show Hutchinsonian teeth and in any case they tend to lose their characters after the age of twenty so that the absence of typical teeth should not weigh against a diagnosis of congenital syphilis Hutchinsonian teeth should not be confused with **hypoplastic teeth** (fig 36) the result of illnesses in infancy Hypoplastic teeth are pitted and irregular but not peg shaped and notched. They certainly occur in congenital syphilitics, but are also due to many other diseases of infancy

Moon's teeth are dome shaped first molars, the central part of the crown having failed to develop and the sides having fallen together They are diagnostic of congenital syphilis.

The Larynx.—A discussion of the various appearances found in syphilis of the larynx would be out of place in this book, as it belongs properly to special works on *laryngology* These are no doubt in the possession of the practitioner who is sufficiently skilled in the use of the laryngoscope to appreciate what he sees with it, and the remarks which follow will be only general in character

The larynx is often affected in secondary and in tertiary syphilis. When a patient develops a hoarse, raucous voice without suffering from any particular local pain or constitutional symptoms, and he is not one who uses his voice greatly it is very suspicious of syphilis, and a search will generally reveal other signs about the body or mucous membranes which confirm the diagnosis. Sometimes some œdema of the glottis may lead to dyspnœa, which *may* be increased temporarily by the first injection of salvarsan (Jarisch Herxheimer reaction see p 387). The chance of increased obstruction of the larynx occurring just after a first injection of salvarsan makes it necessary to be ready for this emergency in cases of laryngeal syphilis where, from œdema or other causes, there is already some

obstruction. The cases where this is necessary are, however very rare.

Tertiary ulceration of the larynx may cause very extensive deformity and for this reason it is important to settle the diagnosis and commence treatment early before, if possible, any ulceration has commenced. Sometimes tertiary ulceration reaches from the larynx to the skin over it. Apart from local syphilitic affections of the mucous membrane and cartilages of the larynx, the nerves supplying the larynx may be implicated in syphilitic processes, and various paralyses result. The commonest of these is paralysis of one or other recurrent laryngeal nerve as a result of aneurism of the aorta, subclavian, or innominate artery. Temporary paralysis of the abductors is sometimes a manifestation of tabes, producing acute dyspnoea (laryngeal crisis).

Affections of the Eyes

The affections of the eyes which result from venereal diseases are gonococcal and syphilitic in origin. Both types may conveniently be considered together since in certain cases they may have to be diagnosed one from the other.

The Gonococcal Affections of the eyes may be divided into those in which the gonococcus is conveyed to the eye from without, and those in which it is carried there by the blood-stream. Of the two, that in which it is carried by the blood-stream is by far the most frequent in adults.

Gonorrhoeal ophthalmia, in which the conjunctiva is infected directly by the finger or otherwise contaminated with gonorrhoeal pus, is not a frequent complication of gonorrhoea in adults. In my own experience it has occurred once in about every fifteen hundred cases. The patients were mostly men who were suffering from a slight gleety urethral discharge, and quite often imagined themselves cured.

The conjunctiva becomes intensely inflamed and swollen, and there is a profuse discharge from between the lids. The chemosis is often so great that a large portion of the cornea is covered by the swollen conjunctiva. Unless the eye is promptly treated the cornea usually ulcerates deeply and the eye is destroyed Sometimes, however the cornea may ulcerate superficially and recover with some opacity which clears up in time. The distinguishable features are the intensity of the inflammation, with chemosis, and profuse discharge containing gonococci. These contrast with the signs of the metastatic infection, in which the inflammatory signs are milder and there are no gonococci in the discharge.

The gonococcus often persists in the eye secretions for many weeks in spite of treatment, and this is a feature which reveals the difficulty of freeing another mucous membrane than that of the urethra, from gonococci. In one case under the writer's control gonococci were found for three months in spite of the most careful treatment. Then, apparently they disappeared, and the patient was discharged from hospital, only to be re-admitted a few weeks later for relapse.

Metastatic gonococcal conjunctivitis, iritis, and scleritis are usually associated. The conjunctiva is injected, and there is a slight purulent discharge, which often arouses the suspicion of ophthalmia, but the discharge contains no gonococci. There is usually some circumcorneal congestion and the iris may be irregular at its pupillary margin (owing to adhesions) and lustreless, while photophobia may be intense. The condition is diagnosed from syphilitic iritis by the more serous nature of the iritis, and the associated gonorrhœa without syphilis. It is very common to find that the patient is also suffering from arthritis, or some other metastatic gonococcal infection, and the prostate or seminal vesicles, or both, are usually infected.

Syphilitic Affections.—Primary syphilitic chancre may be found on the eyelid or the conjunctiva.

Plate XIII.









(1) R[illegible] [illegible] of [illegible] syphilitic [illegible]. Both cornea[illegible] opaque. (Maitland Ramsay.)

(2) Primary chancre on lower eyelid. (Maitland Ramsay.)

(3) Primary chancre [illegible] upper eyelid. (Maitland Ramsay.)

Chancre of the eyelid (Plate XIII) is found most often at the inner canthus, perhaps because this region is more often rubbed with the finger than elsewhere. The erosion or ulcer is circular and well defined, with rounded edges surrounded by an areola, which covers an infiltrated and stiffened area, and it has a saucer-shaped base. The affected lid is thickened and may be indurated in its entire length. The preauricular or submaxillary lymphatic glands, or both, may be painlessly enlarged and prominent.

The presence of the spirochaeta pallida, the surrounding rampart of induration, the syphilitic areola, and enlarged glands should generally suffice for a diagnosis.

Chancre of the conjunctiva is rare and usually results from the practice of licking off a foreign body. It commences as a papule, which quickly grows into a round or oval, elevated sore which is superficially eroded or ulcerated. The diagnosis is effected by the microscope.

During the secondary stage of syphilis various eye lesions may occur. Moist papules may be found inside the lids, as white, elevated lesions about the size of a split pea or bigger. The diagnosis is usually easy because of the presence of other manifestations of active syphilis. Instead of discrete lesions, general blepharitis may occur and this may be so severe as to result in loss of eyelashes, which is sometimes permanent.

Syphilitic iritis and irido-cyclitis may be considered together since they are usually associated, and it is difficult to say where one begins and the other ends. It may commence very quickly after the appearance of the chancre, but is not usually found before the end of the first six months. The patient complains of pain around the orbit and in the eye itself, and there is photophobia, with increasing dimness of vision. Examination shows a variety of appearances depending on the age and severity of the process. There may be simply some dulling of the iris, with circumcorneal injection, and on dilating the

pupil its irregularity shows that adhesions have already formed.

In more severe cases, and those which are not treated promptly the iris becomes duller the pupil is contracted, and the plastic material which is exuded may grow across the pupil completely occluding it. The tendency to adhesions is very great, and these may be so complete that the *anterior chamber is shut off from the posterior* The iris is then bulged forward by the pressure of the fluid behind and a condition of glaucoma may be produced The anterior chamber becomes muddy from the effusion of plastic material and a small hypopyon may form or there may be a small effusion of blood into the anterior chamber The angle between the iris and the cornea may become blocked with plastic effusion, and increased tension result from interference with the natural drainage, but increase of tension is not a common phenomenon in syphilitic iritis.

In other cases the iritis is more localised in character some reddish yellow papules forming on the iris, and near these the circumcorneal congestion or hyperæmia is greater

Diagnosis —*It is important to recognise secondary syphilitic iritis as early as possible* since the great tendency to the formation of adhesions may very quickly ruin the eye for all useful purposes, unless treatment is prompt. *It is* a condition which is particularly amenable to salvarsan treatment, so that the difference between the results of prompt and delayed diagnosis is very striking *It is* not usually difficult to make a diagnosis, as the patient either shows signs of active syphilis elsewhere on his body or gives a history of recent manifestations. In *gonococcal* or so-called rheumatic iritis, the effusion is more serous in character the tendency to adhesions is not nearly so great, and there is more conjunctival congestion Naturally absence of any history of syphilis with a definite history of a gonococcal infection assist the diagnosis. In those rarer cases of syphilitic iritis in which the tension is

greatly raised the question of glaucoma may arise, but can be settled by the youth of the syphilitic patient, his history and the other signs or stigmata of syphilis. The iris does not bulge in glaucoma. It is important to be sure of the diagnosis, since atropine is always pushed in the syphilitic condition for fear that adhesions may form.

In the tertiary stage of syphilis a single gumma may appear in the iris as a body like a pea. It is usually associated with gumma of the ciliary body which can be seen through the dilated pupil, pushing the iris forward. The gumma may break down and cause a hypopyon, or spread through the sclerotic and appear as a small tumour at the corneal margin.

Interstitial keratitis in its active stages is not often seen in adults, being generally a manifestation of congenital syphilis which appears between five and fifteen years of age. It occurs very rarely in acquired syphilis.

The cornea gradually becomes opaque in a patchy manner the opacity spreading from the margin to the centre and some patches being denser than others. Usually after a few weeks the other cornea begins to be similarly affected. After the opacity has existed for some weeks, the cornea becomes vascularised, with very fine vessels invading it, and the vascularisation may be so dense that a pink patch is produced—the classical "salmon patch." In the course of the disease the cornea may become weakened and bulge before the intra-ocular tension or it may become ulcerated. After remaining for many months, the opacity gradually clears, but some patches of opacity are often left in the cornea. There is usually a greater or less amount of iritis and choroiditis in addition to the keratitis, and as the amount of these cannot be gauged through the opaque cornea, it is wise to be cautious about the prognosis.

In another form, the greater burden falls on the iris and choroid, and the keratitis is more punctate in character Opaque dots form at the back of the cornea and these

coalesce to a triangular patch of opacity in the lower segment. The signs of the associated iritis are those of the plastic form already described.

The diagnosis of interstitial keratitis is not difficult when the above characters are considered with the history. Opacity of the cornea due to paralysis of the ophthalmic branch of the fifth nerve, **neuro-keratitis**, is distinguished easily by the associated anæsthesia of the cornea and temple, by the history of acquired syphilis, and by the cerebro-spinal fluid.

Various parts of the eye and orbit may be affected in **tertiary syphilis**, but all forms are rare.

The LIDS may be occupied by gummatous, nodular swellings, which may ulcerate in the typical manner. The ulcer is distinguished from malignant disease by the character of its margin, rate of growth, and non-involvement of glands. Instead of definitely localised gummata, the lids may be diffusely infiltrated, becoming thick and hardened, while the skin and conjunctiva are reddened. *The diffuse, tough thickening of the lids, with involvement of the tarsal plates, suggest syphilis*, since diffuse infiltration is common in the tertiary syphilis of all submucous tissues.

Gumma of the lachrymal gland appears as a painless swelling in the upper and outer corner of the orbit, which may cause diplopia by its mechanical interference with the movements of the eye. The gumma may break down and discharge through the eyelid, but generally resolves.

Tertiary syphilis of the sclerotic may occur as a diffuse, tough thickening, or as a localised tumour close to the corneal margin, which is generally associated with gumma of the iris.

Gumma of the orbit may be easy or difficult to diagnose according to the position of the tumour. If it is far enough forward, it may be felt as a rounded tumour; otherwise there are only the signs of intra-orbital tumour for guidance. There is dull pain in the orbit, which is worse at night,

and some tenderness on pressure over the orbit or the temporal bone. The lids and conjunctiva are swollen, and there is limitation of the movements of the eye towards the affected side. This produces diplopia, which may also result from involvement of the third nerve fibres in the gumma. When the tumour is in the posterior part of the orbit, there is some exophthalmos, and the nerves passing through the sphenoidal fissure and optic foramen are involved, with resulting papillitis and oculomotor paralysis.

The *diagnosis* rests mainly on the signs of intra-orbital tumour with evidence of syphilis elsewhere, a positive Wassermann reaction, and the history. The safest plan is to treat on suspicion of syphilis.

The innervation of the eye is so often affected in syphilis that any sign of interference with the movements of the eyeball or the iris, or of anæsthesia of the conjunctiva and cornea should always stimulate a search for a syphilitic origin. Not that syphilis is invariably the cause of these disturbances, but it should always be thought of when there is no other obvious cause. As already mentioned, the nerve supply may be implicated in orbital gummata, but in the great majority of cases the disturbance arises from intracranial syphilis, and the subject may more conveniently be considered with the examination of the nervous system (see p. 178).

CHAPTER X

THE THORACIC AND ABDOMINAL VISCERA, AND THE VESSELS

Most of the syphilitic affections of the viscera and large vessels are dealt with sufficiently in general text books to warrant only their brief mention here.

The Heart —Gonococcal affections of the heart are probably commoner than is supposed, but seem rarely to attract attention except in the very rare ulcerative form. The frequency of simple gonococcal endocarditis is unknown, as it is comparatively rarely that a valvular bruit is noted in cases of gonococcal arthritis and still rarer that one persists on recovery It is quite possible, however that endocarditis is present in many of those cases of arthritis where the patient looks worse than his joint symptoms justify where the temperature is more sustained and the heart s action is rapid and perhaps irregular In some of these cases a valvular bruit can be heard, but it generally clears up in convalescence and is then considered to have been functional.

Fatal ulcerative endocarditis is very rare, and I know of only one death from endocarditis which has occurred amongst the military gonorrhœa cases in England and France during the war It is very apt to be overlooked at first, as a bruit is comparatively unusual in the early stages. It is always wise, therefore, not to rely on the bruit, but to suspect ulcerative endocarditis in a patient who, while suffering from arthritis or other metastatic complication of gonorrhœa, looks constitutionally worse than his joint symptoms warrant who lies in bed with a half weary

half-anxious expression on his face, and expresses himself as feeling generally very weak. The temperature is well sustained or hectic in type, the pulse is rapid and may be irregular and the patient is dyspnœic.

The condition may be purely gonococcal, or complicated with other micro-organisms such as streptococci. In the latter case it ends in pyæmia, with emboli and all the other sequelæ of the ordinary ulcerative type of endocarditis. The aortic valve is the most frequently affected, and sudden death may result from its rupture.

Gonococcal pericarditis is described but is very rare.

Syphilitic diseases of the heart which call for any note are late manifestations, and assume many forms which are often difficult to diagnose by direct means during life. Interstitial myocarditis, localised gummata, endo- and peri-carditis have been found post mortem much more often than they have been diagnosed in life. Their signs and symptoms are sufficiently dealt with in text books on medicine and need not be detailed here. Cardiac symptoms are more often the result of syphilis of the aorta and coronary arteries.

The Arteries.—The arteries generally are very prone to suffer in syphilis. The spirochæta pallida has a predilection for perivascular lymph spaces, and, amongst others, the vasa vasorum of affected vessels become occluded. The tunica media is infiltrated and undergoes fibrotic induration, while its elastic layer is broken, and the intima thickens to compensate for the weakening of the vessel wall which results (figs. 37 and 38). The effect is twofold. On the one hand, the lumen of the artery tends to become occluded, and on the other with the weakening of the vessel wall, it tends to aneurismal dilatation. The total effect depends on the speed of the process, the original lumen of the vessel, and its strength relative to the pressure within it. Larger vessels like the aorta, innominate, subclavians, carotids, femorals and popliteals become aneurismal, though the intima in them is also thickened.

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other causes than syphilis. The results of syphilitic arteritis as it affects the central nervous system will be discussed more closely in connection with that section of the subject.

Aneurism of the aorta and the larger vessels mentioned above is almost always the result of syphilitic disease of their coats. This is shown by the finding of the spirochæta

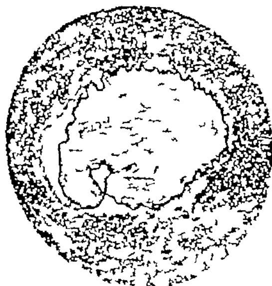


Fig. [illegible]. Small cerebral artery almost occluded by syphilitic endarteritis. Partial detachment of internal elastic lamina.

pallida in the coats of the aorta in cases of aneurism and the almost invariably positive Wassermann reaction which is given by patients suffering from this affection.

Aortic regurgitation is commonly caused by syphilis; either directly from spreading of the syphilitic fibrosis of the arterial wall to the valves, or from dilatation of the aorta.

Angina pectoris is another result of syphilitic disease of the aorta and occlusion of the coronary arteries.

In smaller vessels, like the cerebrals, occlusion generally predominates, though aneurism of cerebral vessels is also common enough.

The effect on the patient naturally depends on the situation of the affected vessels and the parts which they supply It is possible that a large amount of syphilitic arterial disease may be, so to speak, silent as regards

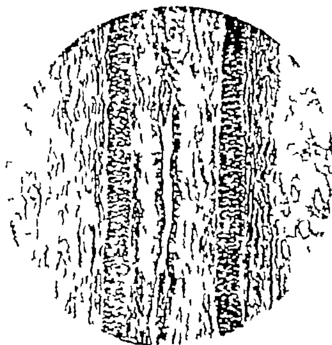


FIG. 37 Coronary artery showing almost complete obliteration of lumen by syphilitic endarteritis.

obvious symptoms and it is only when the importance of the parts supplied, such as the brain or heart, causes focal symptoms urgently to attract our attention that we think of syphilis.

There is a close connection between many cases of general arterio-sclerosis and syphilis, especially between the ages of thirty and fifty as would easily be imagined from what has been said regarding the effect of syphilis on arteries generally though arterio-sclerosis is doubtless due to many

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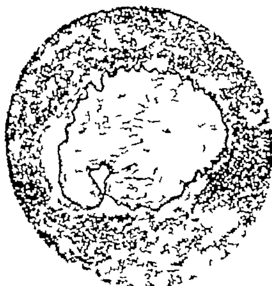


FIG. 32. Small cerebral artery almost occluded by syphilitic endarteritis. Partial detachment of internal elastic lamina.

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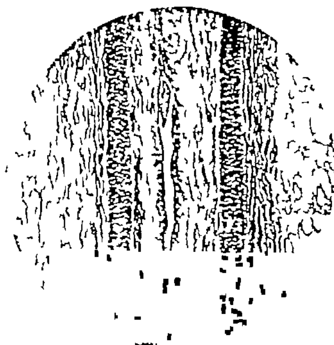


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THE VEINS.—Phlebitis may occur more especially in the legs, but is very uncommon. A form which causes an erythema nodosum of the legs has already been mentioned (p. 90).

THE AIR PASSAGES BELOW THE LARYNX.—Syphilitic disease of the trachea and bronchi is not common; at least, it is rarely recognised. One may suspect it and treat accordingly when chronic ulceration of the trachea or bronchi occurs in a syphilitic subject. Fortunately anti-syphilitic remedies act so quickly now that the suspicion can easily be put to the test by treatment.

THE LUNGS.—In tertiary syphilis a localised gumma, or chronic interstitial pneumonia may occur, but both are very rare in acquired syphilis.

Gumma of the lung causes signs of local consolidation and subsequent cavity formation, so that it may be mistaken for phthisis. It is distinguished by the slightness of the constitutional symptoms in comparison with the size of the local lesion, and the consolidation favours the lower lobes rather than the upper. Also, at a time when one would expect, from cavity formation, that the disease would have spread to other lobes as well as to the other side, one finds in gumma that it is still confined to one or perhaps two spots.

Interstitial pneumonia resembles phthisis, but is distinguished by its slowness and the mildness of the constitutional symptoms, as well as by the history, the Wassermann reaction, and the absence of tubercle bacilli.

Pleurisy may occur in secondary syphilis, but is uncommon. It may also result from the spread of a gumma to the surface.

THE ŒSOPHAGUS, STOMACH AND INTESTINES, excluding the rectum, which has been considered (p. 98), are sometimes affected in syphilis, but the condition is diagnosed *post mortem* more often than in life.

THE LIVER is not often noticeably affected in the *secondary stage* of acquired syphilis. Sometimes catarrhal

jaundice occurs, and, very rarely a condition which is in distinguishable from acute yellow atrophy In the *tertiary stage* diffuse interstitial infiltration may lead to cirrhosis, and gummata sometimes occur Sometimes a gumma breaks down and leads to symptoms which rather closely simulate tropical abscess.

THE PANCREAS is also sometimes affected in tertiary syphilis. For the signs of hepatic and pancreatic disease, the reader is referred to general text books.

THE KIDNEYS are often affected in secondary syphilis, but the signs in themselves are indistinguishable with certainty from nephritis due to other causes. The chief distinguishing features of syphilitic nephritis are its onset with syphilis, the effect of anti-syphilitic remedies on it, and the large amount of albumen to be found in the urine.

Sometimes albuminuria occurs before the appearance of the rash and there may be some co-existing œdema. During the secondary stage simple albuminuria, without any constitutional symptoms or œdema, is found fairly often. It usually disappears after the first dose of salvarsan, or similar arsenical remedy Symptoms of acute nephritis are rarer The urine is then scanty and contains a very high percentage of albumen more, in fact, than in any other form of nephritis, and the albumen is associated with blood and casts of various kinds. The associated symptoms are generally severe, and may be quickly fatal. These cases are anxious ones, since they affect the question of administering anti-syphilitic remedies, and it may be difficult to state from the symptoms whether the disease is syphilitic in origin or not. Mercury and salvarsan are believed to have a bad influence on nephritis when this is due to other causes, so that, on theoretical grounds, the question of their administration would appear to depend on an exact diagnosis of the ætiology of the nephritis. As a matter of practice, if it is clear from other signs, that the patient is suffering from syphilis, I believe that it can

only be right to administer anti syphilitic remedies, regulating the dosage to the condition as will be discussed later If the syphilis is not treated the well-known preference of the spirochæta pallida for damaged tissues will result in the nephritis becoming mainly syphilitic, if it is not so from the beginning

Tertiary renal syphilis may be interstitial, causing symptoms of chronic interstitial nephritis, or much more rarely gummatous.

The **suprarenal capsules** may be involved in a syphilitic process, and symptoms of Addison s disease result.

CHAPTER XI

SYPHILIS OF THE CENTRAL NERVOUS SYSTEM—CEREBRAL LESIONS

It would be impossible in a work of this nature to detail the diverse forms in which syphilis of the central nervous system may manifest itself, and only the main outstanding features which indicate the presence of a syphilitic nerve lesion and approximately its nature and location will be considered.

From a pathological point of view syphilitic diseases of the central nervous system may be divided into those which primarily affect the supporting and nutritional structures and those which primarily affect the parenchyma. The former include affections of the meninges and blood vessels and are very amenable to treatment. The latter include the so-called parasyphilitic lesions—tabes, general paralysis, and tabo-paralysis, and are notoriously intractable.

Although pathologically it is possible to divide the several lesions in this manner it must be remembered that, in cases of parasyphilis, both varieties generally exist in the same patient. In fact, it is possible that much of the improvement noted in cases of tabes, etc., as a result of anti-syphilitic treatment is due to the action of the latter on the associated syphilis of the supporting structures.

Syphilis of the supporting structures may be divided into those forms in which the outstanding symptoms are due to pressure on adjoining structures, or their invasion by gummatous infiltration, and those in which they are due

to loss of nutrition through arterial disease. The two forms are generally combined and meningeal affections probably never exist without implication of arteries, though it is possible that syphilitic arteritis can occur without co-existing active meningitis. One would judge this, at least, from the fact that in certain cases where the symptoms point to occlusion of some cerebral artery no changes are found in the cerebro-spinal fluid.

Both cerebral and spinal regions are affected in practically all forms of central nerve syphilis, but the symptoms are usually more prominent in one region than the other and it will be most convenient to deal with the cerebral and spinal lesions as if they were separate affections.

Syphilitic Affections of the Brain

Cerebral arteritis may be considered first, since it is at the root of many of the symptoms observed in syphilitic meningitis. Many cases occur however in which the symptoms of meningitis are absent and the outstanding feature is arteritis of one particular vessel supplying what might be termed a localisable area of the brain.

The pathological process is the same as that already sketched in connection with the aorta (p 157). The whole of the coats of the artery are infiltrated with lymphocytes and plasma cells, weakening them, and there is cell proliferation between the endothelium and the fenestrated membrane. The endothelium becomes enormously thickened, and the calibre of the artery correspondingly reduced (fig 38) eventually thrombosis may cause complete closure of the vessel. The process is spoken of as endarteritis obliterans, but the evidence is strongly in favour of its origin in disease of the vasa vasorum, and the endarteritis being a defensive mechanism to compensate for the weakening of the arterial wall which results from the above process. If the disease progresses rapidly outstripping the compensatory defensive measures, or if

the latter are inadequate at any spot, the vessel yields there, and an aneurism is produced, as in the case of the aorta or elsewhere. The condition may be entirely silent, or almost so, as regards outward symptoms. Thus, the most extensive arteritis may be found in a patient who was apparently well, or at any rate presented no arresting symptoms, up to the time when perhaps the basilar artery became completely occluded with a thrombus, and death resulted.

Another feature of great diagnostic importance is that the first symptoms are often transitory. Such transitory symptoms should always be regarded as providential warnings as to the grave state of the patient's cerebral blood-supply since, if they are neglected, the next indication of disease is likely to be an attack which leaves lifelong after-effects.

The comparatively symptomless nature of arteritis, and the transitory nature of warning attacks, might be explained in this manner. In matters relating to cerebral nutrition, nature provides large reserves and can carry on when the transport of cerebral supplies is being seriously hampered. No sign of the difficulties under which these are being maintained through the narrowed arteries may be apparent until the patient draws too heavily on his reserves, by excesses either in work or pleasure. Then may come a temporary hitch in the arrangements, the supply to some particular area having stopped, and the patient shows it by some sudden confusion of thought, loss of memory or of consciousness, slight aphasia, diplopia, monoplegia, or hemiplegia, and so on, depending on the location of the starved area of brain. Rest allows the original compensatory forces to resume their sway and the symptoms disappear.

These are the cases in which so much can be done. If the significance of the warning symptom or symptoms is appreciated properly and the patient put on antisyphilitic treatment at once, it may make the difference

to loss of nutrition through arterial disease. The two forms are generally combined and meningeal affections probably never exist without implication of arteries, though it is possible that syphilitic arteritis can occur without co-existing active meningitis. One would judge this, at least, from the fact that in certain cases where the symptoms point to occlusion of some cerebral artery no changes are found in the cerebro-spinal fluid.

Both cerebral and spinal regions are affected in practically all forms of central nerve syphilis, but the symptoms are usually more prominent in one region than the other and it will be most convenient to deal with the cerebral and spinal lesions as if they were separate affections.

Syphilitic Affections of the Brain

Cerebral arteritis may be considered first, since it is at the root of many of the symptoms observed in syphilitic meningitis. Many cases occur however in which the symptoms of meningitis are absent and the outstanding feature is arteritis of one particular vessel supplying what might be termed a localisable area of the brain.

The pathological process is the same as that already sketched in connection with the aorta (p. 157) The whole of the coats of the artery are infiltrated with lymphocytes and plasma cells, weakening them and there is cell proliferation between the endothelium and the fenestrated membrane. The endothelium becomes enormously thickened, and the calibre of the artery correspondingly reduced (fig 38) eventually thrombosis may cause complete closure of the vessel. The process is spoken of as endarteritis obliterans, but the evidence is strongly in favour of its origin in disease of the vasa vasorum, and the endarteritis being a defensive mechanism to compensate for the weakening of the arterial wall which results from the above process. If the disease progresses rapidly outstripping the compensatory defensive measures, or if

with other paralyses, indicating the blocking of more than one artery or it may be complicated with sensory phenomena. In either of these cases one would look to syphilis rather than embolus for the cause.

Occlusion of cortical arteries results in monoplegias, which may gradually extend until the whole half of the body is paralysed. Hemianopsy results from blockage of the posterior cerebral supply to the optic radiations in the occipital lobe. Occlusion of the basilar artery is quickly fatal, while occlusion of branches to the crus and pons produces hemiplegia, with paralyses of various cranial nerves which will be considered later.

The irritation caused by adjacent softening in the anterior part of the internal capsule of the frontal region may cause epileptiform fits, which may gradually extend and become unrecognisable from true epilepsy. Convulsions which commence for the first time in adult life are always very suspicious of brain syphilis, when they cannot be ascribed to such an obvious cause as uræmia, diabetes, chemical or alcoholic poisoning, cerebral tumour or non-syphilitic meningitis.

Widespread arteritis, acting as it does on all portions of the brain, may produce every kind of psychic disturbance, including insanity, which will be mentioned in more detail under meningitis.

As mentioned, an artery affected with arteritis may give way on one side. The resulting aneurism may exercise pressure on the adjoining structures, or may suddenly burst and lead to the patient's death from cerebral hæmorrhage.

Syphilitic meningitis may primarily affect the dura, or the soft membranes, and may be localised or diffuse. Generally speaking, it is diffuse when it affects the soft membranes, while it is usually localised when the dura is affected.

Cerebral syphilitic **leptomeningitis** is generally diffuse, and affects most often the base. Some degree of meningitis

between his remaining a supporter of or becoming a dependent on his family

On the other hand the hitch may be a more serious one, and the symptoms increase in severity without any remission. These are the cases in which the artery remains blocked and secondary changes follow in the shape of softenings of the areas of brain supplied. Unless the patient dies out of hand there is in these cases a tendency to some recovery but the patient is often left more or less crippled in regard to the affected function. There is no cerebral function which may not be put out of action by syphilitic blocking of the arterial supply concerned in its nutrition and it will be possible to mention only a few of the symptom complexes which may occur

The lenticulo-striate artery is often thrombosed and the supply to the internal capsule, corpus striatum and optic thalamus cut off. The outstanding feature in this case is hemiplegia, with or without aphasia, according to the affected side. Both arteries may be variably blocked and there may be complete hemiplegia on one side with partial on the other Sensory effects are not so frequent and are then usually associated with motor If the blockage occurs suddenly there is loss of consciousness, but if very gradual this may not occur Between the two there may be all degrees of somnolence.

It is not generally difficult to distinguish the hemiplegia caused by syphilitic endarteritis from that due to embolus or to hæmorrhage from other causes. The youth of the patient would in most cases exclude hæmorrhage from other causes than syphilis, and there may be a history of warning attacks, with other signs of syphilis to assist. Embolus would be excluded by the absence of heart disease though naturally heart disease might co-exist with a syphilitic lesion. In the latter case the attack might have been gradual, or preceded by a warning attack, which would indicate a gradual thrombosis rather than an embolus. The hemiplegia may also be associated

Pathologically the meninges at the base are extensively infiltrated and matted together with an exudate of lymphocytes and plasma cells. The process is most intense at the interpeduncular spaces and the chiasma so that one may expect the structures at these points to suffer most. The arteries at the base of the brain become involved, with resulting greater or less occlusion, or aneurism, and the disease tends to extend along the pial sheaths of arterial branches into the interior of the brain causing total or partial occlusion of arterial twigs. One or more of the cranial nerves passing through the diseased area are also frequently involved, either by invasion of their sheaths, or by pressure, and symptoms of a damaged cranial nerve very strongly suggest syphilitic meningitis. The cerebral tissue suffers directly and indirectly—directly from pressure of the exudate, and indirectly from occlusion of terminal arteries, with loss of nutrition to the parts they supply.

The complexity of the functions which are served by the nerve tissue directly or indirectly affected by basic meningitis accounts for the complexity of the symptoms displayed.

Symptoms.—One of the commonest symptoms of meningitis, which usually precedes others by weeks or months, is *persistent headache*, often worse at night and hardly ever leaving the patient. It affects the frontal, parietal, and occipital regions, and may be so persistent as to produce severe ill health from loss of appetite and sleep. It is a valuable symptom when its significance is appreciated, and such a headache should always provoke enquiry as to syphilis, with an examination of the cerebro-spinal fluid.

A train of symptoms which can be ascribed to chronic cerebral anæmia resulting from general endarteritis of the arteries at the base often characterises severe basic meningitis, and, here again, the salvation of the patient depends on a due appreciation of symptoms which might easily be ascribed to over-work, neurasthenia, "liver" or

is extremely common in secondary syphilis if we may judge by the very high percentage of cases in which pathological changes—increase of lymphocytes, presence of globulin and a positive Wassermann reaction—are found in the cerebro-spinal fluid. For instance Dreyfus reported pathological changes in nearly 80 per cent. of secondary cases. Mr C. H. Mills has obtained a number of specimens of cerebro-spinal fluid at Rochester Row and examination of these has shown pathological changes, indicating syphilitic meningitis in 6 out of 30 primary cases, 87 out of 185 secondary cases 21 out of 63 tertiary cases 0 out of 14 congenital cases, and 18 out of 41 cases where the only sign of remaining disease was a positive Wassermann reaction of the blood None of the cases mentioned in these statistics showed any other sign of brain or cord disease.

As these results show in the great majority of cases, syphilitic meningitis is silent as regards clinical symptoms, if headache is excepted Even headache, which is so often noted in text-books as a common symptom of secondary syphilis, is not very common, and I do not believe that one in twenty cases of secondary syphilis suffers from it.

Although meningitis in which symptoms are observed is uncommon it is a manifestation of syphilis which is of the greatest importance since its severer forms leave residua which very greatly impair the patient's earning capacity It is uncommon for clinical symptoms of cerebro-spinal meningitis to appear in the early eruptive stage of syphilis, although cases have been observed in which pronounced meningeal symptoms were found even before the first eruption. *More frequently they may be* expected from about the time of the first relapse, say from the sixth month to about the fourth year This contrasts with general paresis and tabes which usually commence in the later years. In the majority of instances, the treatment has been very indifferent or has been completely suspended for some weeks or months.

of gummatous infiltrates, or to occlusion of arteries supplying nuclei of origin. The symptoms of all forms may be dealt with together

The olfactory nerve is rarely sufficiently involved in diffuse meningitis to cause arresting symptoms. It may be involved in a gumma, but then the loss of smell which results is often hidden amongst a train of other symptoms.

The optic nerve, chiasma, and tract are of great importance from the point of view of diagnosis since they are so often affected in cerebral syphilis The dimness of vision which results from affections of the optic nerve, etc varies in degree and distribution, and one or both of the latter may give valuable information as to the nature and locality of the lesion.

As already mentioned, the nerve may be involved in a gumma of the hinder part of the orbit. The position of the lesion is then indicated by signs of intra-orbital tumour besides the fact that one eye only is affected.

General dimness of vision with signs of choked disc is usually due to intra-cranial tumour producing increased intra-cranial pressure. The diagnosis of the nature of the tumour depends on other facts which will be discussed later under gumma of the brain.

The most important eye symptoms are those which signalise the invasion of the nerve, chiasma, or tract by syphilitic meningitis, pressure on it by gummatous infiltrates, or occlusion of arteries to its central origin. As already mentioned, the points of greatest intensity of syphilitic meningitis are the regions of the chiasma and interpeduncular spaces and it is not surprising that the nerve and its tract should suffer

When the dimness of vision is unilateral and there is optic neuritis, or if bilateral one eye started after the other the indications are in favour of an invasion of the nerve by gummatous infiltrate. Owing to the external position of the fibres to the *macula lutea*, these are first involved in an invasion from without, and central scotoma results.

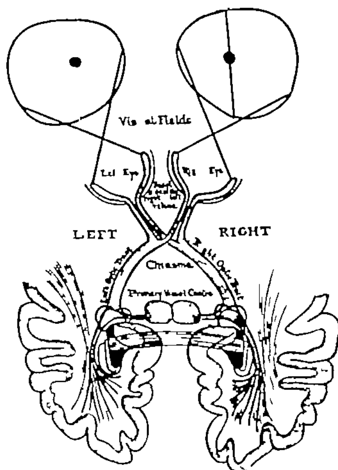
some other than their correct cause. The patient's intellect is so to speak blanketed he becomes lethargic and *dull taking perhaps minutes* to answer simple questions which should be answered in seconds and giving his answers slowly with as few words as possible. His power of application is diminished, and he may suffer from attacks of *vertigo* or *fainting on suddenly standing* or on fatigue.

When psychical disturbances occur they differ from the mental disturbance of general paralysis in being fixed rather than liable to change on suggestion, and the patient is generally alive to the fact that he is not well mentally. Hallucinations and delusions are uncommon but a patient may become very irritable or violent, or may suddenly lose his memory. On the other hand with or without any of the preceding symptoms, except perhaps the persistent headache, he may become comatose and die. Or having become comatose, he may slowly regain consciousness, perhaps pass through a stage of violence, and again lapse *into the dull lethargic state which preceded* the coma. There is, in fact, hardly any limit to the variety of the mental symptoms which may be displayed. A feature of these is that they are precipitated or intensified by fatigue, and improve somewhat on resting. Doubtless, much of this depends on the abolition and restoration of nutrition through the narrowed arteries.

Focal Symptoms.—The above may be the only manifestations, especially if they are recognised and promptly treated. More frequently *focal symptoms eventually show them*selves, owing to local pressure of infiltrates on cerebral tissue or occlusion of some important artery or invasion of one or more cranial nerves. Some of the main localising symptoms connected with arterial occlusion have already been considered.

Paralysis of one, or a group of cranial nerves often occurs without any preceding signs of meningitis. It may be due to direct invasion of the nerve sheaths, or to pressure

PLATE XIV



Diagrammatic representation of visual fields and optic tracts, after M tt, to illustrate the mechanism of homonymous hemianopsy Illustrates also how lesion of the optic tract destroys the light reflex, hile one in the occipital lobe leaves it intact.

Invasion of the chiasma or tract causes bilateral symptoms, the field of vision being restricted in one portion of each eye. When the centre of the chiasma is affected alone, there is bi temporal hemianopsy and when the external fibres on both sides are involved bi nasal hemianopsy results.

Homonymous hemianopsy the field of vision of both eyes being restricted on the right or the left depends on an affection of the optic tract or occlusion of the branch of the posterior cerebral artery which supplies the optic radiations in the occipital lobe or gumma in the latter The field of vision is lost on the side opposite to that of the lesion (Plate XIV). When the tract itself is involved a *beam of light thrown on the blind side of one of the affected* eyes fails to stimulate contraction of the pupil (Wernicke s pupil reaction) When the hemianopsy is due to occlusion *of the artery supplying the optic radiations,* and there is no associated basic meningitis, it may be possible to locate the affection by the absence of changes in the cerebro-spinal fluid. Also, Wernicke s pupil reaction is not obtained.

The **third, or oculo-motor nerve** which supplies the superior internal and inferior rectus, the levator palpebræ, the inferior oblique, the sphincter pupillæ, and ciliary muscles, is very commonly attacked in syphilitic nerve disease. The effects are seen in interference with the movements of the eye-ball, or the pupil, or both.

As mentioned the whole or portions of the third nerve may be involved in an intra-orbital gumma, with or without the optic and adjoining nerves. More often, the cause lies in basic meningitis, pressure of gummata, or occlusion of arterial twigs supplying one or more of the several groups of cells composing its nucleus. The paralysis is very rarely complete and bi lateral most often it is partial and unilateral. All combinations of paralysis may occur but the levator palpebræ is often paralysed alone, or other muscles without the levator palpebræ. It is usually possible only to surmise the exact location and nature of the lesion

but the following are a few of the paralyses which indicate it more clearly than others.

Ptosis on one side is significant of syphilitic endarteritis of the twig which goes to the portion of the third nucleus concerned in the supply of the levator palpebræ. Paralysis of one iris, the pupil being dilated and unable to contract, may be due to occlusion of the arterial twig supplying the sphincter pupillæ nucleus, which adjoins that governing the levator palpebræ.

Two or more muscles may be paralysed alone from occlusion of the arterial twig which goes to the group of nuclear cells concerned in their nerve supply

Associated symptoms will often give a clue to the locality of the lesion. For instance, oculo-motor paralysis on one side and hemiplegia of the other indicate involvement of the crus, either by pressure or by softening from arterial occlusion.

Transient oculo-motor paralysis, though so frequently due to gross lesions at the base of the brain, may also be a commencing sign of general paralysis or tabes.

The **fourth nerve**, which supplies the superior oblique, is rarely affected alone.

The **sixth nerve**, which supplies the external rectus is involved in similar processes to those which affect the third and other cranial nerves. When it is attacked in the pons there is almost always, also facial paralysis, or opposite hemiplegia.

Symptoms of Oculo-motor Paralysis.—Ptosis has already been mentioned, as also dilatation of the pupil and inability to accommodate. Paralysis of the muscles which govern the movements of the eyeball may be obvious from complete immobility of the eye or the presence of a squint. Or it may become apparent only on the application of tests, and a brief account of the tests by which the affected muscles are located may be useful.

The first indication of interference with the eye movements is diplopia. The affected eye may be found by

The false image may be at a higher or a lower level than the true when the object is held above or below the level of the eyes, according to the case. When the false image is above, there is paralysis of the elevators—superior rectus and inferior oblique. When the false image is below the depressors are affected—inferior rectus and superior oblique.

In addition to being at a different level, the false image may be tilted. If the tilt is with the upper end towards the true image, *and the diplopia is homonymous* the inward rotator the superior oblique, is affected (the false image being below). If it is tilted away the outward rotator



Fig. 39



Fig. 40.

the inferior oblique is affected (the false image being above) (fig. 39). *If the diplopia is crossed*, the tilting of the false image towards the true indicates paralysis of the inferior rectus, and tilting away paralysis of the superior rectus (fig. 40). The tests may naturally be considerably elaborated, but for further details reference must be made to special works. Figs. 39 and 40 Werner's diagram, may assist in remembering the interpretations of tilted false images. The dotted lines indicate the positions of the false images, and the unbroken, those of the true.

In fig. 39 the diplopias are all homonymous, and in

getting the patient to walk first with one and then with the other eye covered when the sound eye is covered he staggers somewhat. Also if the sound eye is covered in such a manner that it can be watched and the other is made to follow an object which is moved before it, the movement of the sound eye is excessive in the direction of movement of the other's paralysed muscle Thus, say the left internal rectus were paralysed and the right eye were covered, while the patient was told to follow with his left eye the movements of an object held up in front of it. As the object was moved towards the right, that is in the direction of movement of the left internal rectus, it would be noticed that the right eye turned excessively outwards. The reason for this is that a stronger impulse than normal has to be sent to the paralysed muscle to make it act sufficiently to follow the object and since, under these conditions, the impulse sent to one eye muscle is equal to that sent to its functional colleague in the other eye, right external rectus in this case, the sound muscle acts excessively

The following tests enable a closer analysis of the condition to be made. Cover the affected eye with a coloured glass and in a darkened room hold up a candle. It will be seen as two, one coloured, the other white, particularly when held to one side or the other or above or below the level of the eyes. Note the position of the coloured with relation to the white image and to the eye. If it is on the same side as the affected eye the diplopia is homonymous if on the opposite side, it is crossed. Homonymous diplopia is caused by paralysis of one or all of the muscles which move the eye outwards—external rectus, and superior and inferior oblique. In crossed diplopia, the affected muscles are those which move the eye inwards—internal superior and inferior recti. Movement of the candle in the direction of action of either of these groups of muscles will confirm the test, since the two images will become more widely separated.

canal, and one or both branches may be attacked. Invasion of the internal branch results in deafness, and of the external in symptoms of Ménière's disease.

The tenth, or vagus may be affected in its course or at its root. According to whether the effect is irritative or paralysing the pulse becomes abnormally slow or quick, and it may be irregular

The spinal accessory and hypoglossal may be affected together or separately with resulting paralysis of vocal cords, soft palate, and tongue on the same side. The lesion may be basic meningitis invading the nerves, pachymeningitis compressing the medulla, or occlusion of arteries supplying the nuclei.

Diabetes mellitus and insipidus have occasionally supervened on syphilitic meningitis.

Meningitis of the convexity may be diffuse, or local, or both. If diffuse, it is usually associated with basic meningitis. The local form is the only one which can be profitably discussed here as giving rise to definite localising symptoms.

Gumma of the meninges may start in the periosteum of the overlying bone or in the meninges themselves, and has often succeeded a blow on the head. It grows into the subjacent brain, producing some or all of the general symptoms of intra-cranial tumour—headache, vomiting, slow pulse, vertigo, epilepsy stupor and double optic neuritis. It is possible, however for a gumma of the brain to produce no noticeable symptoms.

A point of diagnostic importance is that there is often tenderness on percussion over some particular spot on the skull. As it may be important from the point of view of operative interference to localise the gumma, the localising symptoms detailed by Dr F W Mott, F R.S (*A System of Syphilis* vol. IV p 85) may be given in his own words

Operative measures may then have to be resorted to in order to relieve the general symptoms of intra-cranial pressure, to save the sight and to abolish the fits. *Now if*

fig 40 they are crossed. In each the left half of the diagram relates to paralysis of the left eye, and *vice versa*

The **fifth nerve**, or one of its three main branches, may be caught in various syphilitic processes at the base of the brain or the skull, such as gummata or basic meningitis or it may be implicated in pontine lesions as it spreads out here to reach its sensory nucleus, and is then most likely to be combined with opposite hemiplegia. The motor branch is very rarely affected. Symptoms attributable to involvement of this nerve may be the only indication of syphilis of the central nervous system, but fifth nerve paralysis is usually associated with other lesions.

The symptoms may be irritative or the reverse. In the former case, there is neuralgia of the areas of distribution (from the forehead and temples to the lower jaw the eye and the side of the tongue) and the affected areas may be hyperæsthetic. When the paralysis is complete, the symptoms may easily pass unnoticed until some trophic disturbance arrests the attention. Thus, when the ophthalmic branch or the Gasserian ganglion is implicated, conjunctivitis, with neuro-keratitis, leading to opacity and ulceration of the cornea, are apt to result. Trophic changes in the nasal mucous membrane may lead to loss of smell on the affected side

The **seventh, or facial nerve** is often affected with the eighth. In addition to damage by basic meningitis and gummata it may be nipped in its bony canal, or implicated in a syphilitic lesion of the pons. The paralysis differs from that due to a cortical lesion in being complete *i.e.* affecting the upper as well as the lower part of the face. When due to a pontine lesion, there is usually also a crossed paralysis, the opposite arm and leg being affected owing to the associated implication of the pyramidal nerve fibres in the pons before they have crossed. The simultaneous paralysis of the sixth nerve has already been mentioned.

The **eighth, or acusticus** may also be affected in its bony

point to the existence of a tumour; but it must be remembered that optic neuritis may be late in its manifestation or even absent in some tumours of the frontal lobe. A syphilitic tumour affecting the orbital surface of the frontal lobe may press upon the olfactory nerves and give rise to irritation phenomena with a sensory smell aura, or to unilateral anosmia. Epileptiform convulsions may present every gradation or transition, from a local convulsive spasm to general epilepsy. It must not be supposed, however, that every case of epileptiform convulsion or epilepsy in a person with well-marked signs of syphilis is of necessity due to a gummatous syphilitic meningitis or a gummatous tumour of the convexity, as it may be the result of softening from arteritis or it may be the epileptiform convulsion of a general paralytic. In fact there is great difficulty in deciding sometimes between syphilitic brain disease with epileptiform convulsions and true general paresis by the character of fits only.

Cases of cortical epilepsy of syphilitic origin may begin, as I have often seen, with a history of localised Jacksonian epilepsy, but in time the fits spread so as to involve more and more of the motor area of the same side and they then pass over to the opposite side, and with this extension there is an increase of the rapidity of onset, so that eventually it becomes very difficult to distinguish these cases which have started primarily from organic disease from true symptomatic epilepsy. A difference in the size of the pupil or in the reflexes on the two sides, with a hemiparesis or hemiplegia, would certainly indicate the organic origin of the epilepsy. Such cases are not very uncommon in the asylums.

Now the gummatous tumour or syphilitic pachymeningitis may be situated in other regions of the brain and give definite localising symptoms. Thus homonymous hemianopsy, partial or complete, may arise from a gumma in the occipital lobe involving the optic radiations or calcarine regions. A gummatous tumour in the left hemisphere, if

there be a monoplegia in association with the epileptiform convulsions or epilepsy clearly the tumour extends into the motor area but if there be no hemiplegia, the fits severe and of *long standing and signs of intra cranial pressure* present, the tumour will probably be situated in the adjacent pre-central or post-central regions—that is to say in front or behind the ascending frontal convolution. The safest localisation in such case would be a point in front of or behind the region of the ascending frontal convolution which corresponded to the representation of the particular muscular groups in which the fit starts. But to decide whether it is in front or behind we should have to consider (1) Was the fit preceded by numbness or tingling? (2) Is there any loss of muscular sense? (3) Is there any tactile motor defect appreciable by the individual in performing any acquired expert technical work? (4) Is there loss or diminution of the stereognostic sense? Any or all of these sensory disturbances point to the tumour being situated behind the fissure of Rolando in the ascending parietal or the marginal convolution. The irritation of the tumour in such a case spreads forward to the ascending frontal convolution (the region of the psycho-motor cells) and produces the epileptiform convulsions. If on percussion the tenderness indicated the seat of the tumour being situated behind the fissure of Rolando, there would be no doubt as to its situation if, however there were none of these sensory troubles, but a tremor in the hand of the same side, associated with absence of the abdominal reflex on the other together with tenderness on percussion in front of the ascending frontal, then the tumour would be localised in the frontal lobe. Certain other signs of tumour in the frontal lobe should be remembered. If it is on the left side, it may give rise to speech defects and epileptiform convulsions, and I have known such a case wrongly diagnosed as general paralysis by experienced authorities It might be said that an examination with the ophthalmoscope would reveal optic neuritis, and this would

point to the existence of a tumour but it must be remembered that optic neuritis may be late in its manifestation or even absent in some tumours of the frontal lobe A syphilitic tumour affecting the orbital surface of the frontal lobe may press upon the olfactory nerves and give rise to irritation phenomena with a sensory smell aura, or to unilateral anosmia. Epileptiform convulsions may present every gradation or transition, from a local convulsive spasm to general epilepsy It must not be supposed, however that every case of epileptiform convulsion or epilepsy in a person with well-marked signs of syphilis is of necessity due to a gummatous syphilitic meningitis or a gummatous tumour of the convexity as it may be the result of softening from arteritis or it may be the epileptiform convulsion of a general paralytic In fact there is great difficulty in deciding sometimes between syphilitic brain disease with epileptiform convulsions and true general paresis by the character of fits only

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deeply seated may cause a motor aphasia word blindness when situated in the angular region, or word-deafness if situated in the posterior third of the first temporal and the adjacent gyri of Heschl when Broca s convolution is involved there is motor aphasia or dysarthria (difficulty of articulation) usually accompanied by facio-lingual palsy In a case of Wernicke s bilateral gummatous lesion produced deafness. Gummatous tumours anywhere in the speech zone may by involving the association fibres of the various speech centres, produce paraphasic and amnesic conditions. Likewise lesions of the parietal lobe have caused apraxia and parapraxia.

CHAPTER XII

CEREBRAL LESIONS (*continued*)—GENERAL PARALYSIS—DIAGNOSIS OF CEREBRAL SYPHILIS

General Paralysis of the Insane.—The discovery by Noguchi of the spirochæta pallida in the brains of general paralytics has now definitely settled the ætiological relationship of syphilis to general paralysis.

In contrast to other syphilitic affections of the brain and cord the preceding symptoms of syphilis in general paralysis, as in tabes, are notoriously often so trivial as to pass unnoticed. This triviality or absence of preceding symptoms, even triviality of the primary sore has led to the advancement of a theory that these diseases are due to a special neurotoxic virus or spirochæte. Most of the evidence rests on multiple infections from one source of several men, all, or almost all, of whom subsequently developed either tabes or general paralysis. The evidence is so far inconclusive, but it is quite conceivable that there might be a special spirochæte which is responsible for these varieties of syphilis. Just as a variety of spirochæte which is microscopically indistinguishable from spirochæta pallida is the cause of yaws.

The outstanding features of general paralysis are best given in the following summary by Mott " (1) Progressive dementia, usually accompanied by mental exaltation. (2) Unequal, generally irregular pupils, reacting sluggishly or not to light, but reacting to accommodation. (3) Progressive paresis with tremor especially affecting the tongue and face muscles. (4) Hesitant, tremulous, slurred speech

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with elision of syllables and similar affection of handwriting (5) Altered knee jerks, generally exaggerated, sometimes absent on one side, more often on both sides. Usually mixed up with these are many other symptoms which make different types of general paralysis.

A feature of some importance in diagnosis is the extreme rarity of general paralysis or of tabes before the lapse of five years from the date of infection. The commonest dates of onset are between the sixth and the twelfth years, but the disease may be postponed to a much later date. Four fifths of the cases occur from the sixth to the fifteenth years, with a maximun for the tenth which contrasts with the date of onset of other varieties of cerebral syphilis in which two-thirds of the cases, excluding gumma, occur in the first six years of syphilis.

The symptoms depend on a very slow gradual and progressive decay of the cerebral neurones, with secondary *changes in the connective-tissue elements of the* brain. In contrast to other forms of cerebral syphilis, one might say that the patient glides into general paralysis, while he jumps into ordinary cerebral syphilis.

The initial symptoms of general paralysis are so gradual in onset that only those who are intimate with the patient could notice them and even intimates can only say that in some indefinable manner he has changed during the past few months. A casual observer would find in the patient at this period nothing which he could not parallel amongst his sane acquaintances.

The changes are in the direction of lowered mentality in the sense that the patient, perhaps after a period of alternate brooding and apathy becomes forgetful and less attentive to details of behaviour or of business than formerly Gradually the patient becomes more obviously abnormal though still not unlike many of his sane fellows. He embarks perhaps on wild schemes, departs more and more from the routine of business and family life and is voracious of pleasures, both of bed and board.

At this time he may realise in a detached way that he appears different, just as a man who is becoming drunk may realise that his habitual control over those of his lower centres which originate ideas has weakened and that the riot of the latter may give him away In the same manner as the slightly intoxicated, he can still pull himself together and evade pitfalls which would proclaim his condition to an examining doctor If the latter proceeds, however on the assumption that there is a contest between active, irritated centres which originate grand schemes and decaying, higher centres which would normally damn the schemes as nonsense, he will lead the patient by easy stages to talk of his plans, and the grandeur of these may easily furnish useful evidence for his diagnosis.

Besides these indefinite mental symptoms, others may occur which point more clearly to cerebral disease. These vary enormously in character depending as they do on temporary irritation or paralysis of centres governing different functions. Thus there may be attacks of giddiness or fainting, migraine, severe headaches, and transitory squint, diplopia, or ptosis. Or more severe symptoms may appear such as an attack of unconsciousness which may last for days and be followed by transient hemiplegia. Attacks of aphasia of all kinds also occur and epileptiform convulsions which may simulate Jacksonian or true epilepsy and are motor or sensory The pupil may at this time be quite normal, or show the irregularity which is characteristic of the later stages. It may also be sluggish, or inactive to light on one or both sides.

As can easily be imagined, the diagnosis of general paralysis at this time may be extremely difficult. The patient differs little or nothing from many samples of mentality met with in ordinary life, and, unless he has committed the wild excesses or shown some of the more arresting paralytic signs mentioned above, there is little on which to found a diagnosis. It is important to make a diagnosis early and in this stage the value of examination of the blood

and cerebro-spinal fluid can hardly be over-estimated. Pathological changes (p 280) will be found in the fluid in practically every case of general paralysis, and although such changes may not settle the diagnosis between general paralysis and other forms of cerebral syphilis, they focus the attention by showing there is something more in the patient's symptoms than overwork, worry neurasthenia, or biliousness

Succeeding gradually on the prodromal stage, is that of more pronounced symptoms which in many cases may still be explained away Mentally the patient may for a time still appear normal to the casual observer and he may correctly perform the acts and make the responses of ordinary social intercourse. It may be only when required to exercise his judgment on a new point or situation that he shows his irresponsibility and abnormal mentality On the other hand, the mental condition generally reveals itself sooner or later in delusions of grandeur (the most frequent) or of such as lead to the deepest despair The delusions are not fixed but change with the events of the day or the topic of conversation. The patient lives only in the present, gradually becoming more and more impervious to criticism irresponsible, dirty in his habits, indecent, and immoral.

In this stage certain other symptoms proclaim the nature of the disease, apart from the mental condition. The facial expression becomes fatuous or exalted sleepy or weary *looking* Fibrillary tremors of the facial, tongue, and often the hand muscles may be seen when these commence to act, as in the framing of words, showing the teeth closing the eyes, protruding the tongue and extending the hand.

The **pupils** are generally unequal and often irregular being angular and perhaps eccentric, especially when the light reflex is tried The reaction to light is lost in about 50 per cent. of cases.

The **speech changes** are as follows. At first there is difficulty in commencing and some trembling of the lips.

Later there is difficulty in pronouncing all words containing linguals and dentals and such sounds as "b" and "p." When asked to say Mississippi, Irish artillery and the like, the patient stumbles badly running syllables into one another and missing some out.

In writing, also this tendency to miss out essential syllables and words is noticeable and characteristic.

The *muscular power* remains for some time, but gradually there develops a progressive general enfeeblement. The tendon jerks are usually exaggerated, but ankle clonus and Babinski's sign are rare.

Seizures occur much more frequently in this stage than in the prodromal, and are of three kinds congestive, in which the patient suffers a temporary lapse of consciousness, or a slight fainting fit apoplectic and epileptiform, in which the convulsions are unilateral or resemble those of true epilepsy These seizures are often provoked by the toxæmia incidental to intercurrent attacks of pneumonia, tuberculosis, dysentery and enteritis, as well as septic troubles of various kinds. The epileptic fits may succeed one another so rapidly that the patient enters a *status epilepticus* in which he may die.

A noteworthy feature about the symptoms of general paralysis is the manner in which they undergo remissions. A period in which the disease is obviously severe and pronounced is succeeded by one of apparent calm, in which it appears, by contrast that the patient is improving Actually however the underlying pathological process is steadily progressing and the improvement is only symptomatic. What has abated is the delirium due to the above mentioned toxæmia, and the physician should not be misled by it into giving a hopeful prognosis, or be elated because he happens to have administered some specific immediately before the remission set in.

Beyond this, it is unnecessary to follow in detail the progress of a general paralytic. The progressive stages of mental and bodily enfeeblement which succeed, reducing

the patient first to a chair and then to a bed until he finally dies of intercurrent disease, or in a seizure, or by a gradually flickering-out process which may last for days, concern the specialist in mental diseases, since the final stages of this drama are usually played out in an asylum. If the patient does not die of intercurrent disease or in the *status epilepticus* the duration is about five years, though it may be longer

DIAGNOSIS OF CEREBRAL SYPHILIS —The physician who is consulted concerning a given series of symptoms which point to a cerebral affection has two problems to decide. First, whether the underlying cause is syphilis, and secondly the nature of the syphilitic process if such exists.

In the majority of cases the problem is not a difficult one, but every now and again a case appears in which it is necessary closely to review all the facts before it is possible to give an opinion. It may be of some assistance, therefore, if the *main diagnostic features of those diseases* which may come into question are shortly reviewed, even at the risk of some repetition.

In all cases where there is the least suspicion of cerebral syphilis it is essential that the cerebro-spinal fluid be examined (p 280) The result may be negative and the case be still one of cerebro-spinal syphilis, as has been indicated above, but the great value of an examination of the cerebro-spinal fluid lies in the cases where it is positive. An examination of the blood-serum is not sufficient, since it affords no indication of the condition of the central nervous system. *Numbers of times I have found the blood-serum* negative while the cerebro-spinal fluid showed pronounced pathological changes, and in some of these the cerebral symptoms were severe.

The chief diagnostic features of cerebral syphilis *in its* various forms and of some other diseases which may resemble it are as follows.

Meningitis and **arteritis** may be reviewed together since they are so often associated. A very pronounced feature

is the persistent, often paroxysmal headache, usually worse at night, which precedes and accompanies other symptoms.

If the meningitis affects the convexity there is tenderness, and the presence of a gumma is usually indicated by signs of intra-cranial pressure and tumour. In all forms, the mental symptoms vary from somnolence and general dullness of intellect to coma, alternating perhaps with periods of acute delirium and excitement. The mental condition differs from that of general paralysis in this, that if still sane the patient is aware of the change and if he is insane, the insanity is only in certain directions, not general. Epileptiform and apoplectic attacks occur in both this and general paralysis, but in meningitis they are more often followed by definite paralyses, such as hemiplegia, monoplegia, triplegia, and aphasia in various forms.

Paralysis of one or more cranial nerves is a very common accompaniment of meningitis or arteritis and is often the only symptom. Since the oculomotor nerve is so frequently affected the examination of the pupil and movements of the eye is highly important to the diagnosis of coarse syphilitic lesions of the brain or its coverings, though it has to be remembered that transient ophthalmoplegia is often a symptom of early general paralysis. Limitation of the field of vision is significant, and the direction in which the field is restricted may prove a valuable guide to the localisation of the lesion.

Early onset is characteristic of coarse lesions, although gummata may occur as late here as in any other part of the body. The presence of obvious signs of syphilis on the body, the manner in which the symptoms irregularly ebb and flow, and their response to anti-syphilitic treatment all favour coarse lesions rather than general paralysis. Ankle clonus and Babinski's sign also favour ordinary cerebral syphilis.

The chief characteristics of general paralysis are progressive dementia, pupillary changes, progressive paresis,

slurred hesitating speech, and altered knee jerks. The mental changes differ from those of coarse affections in being general rather than partial in the patient's unconsciousness that he is in any way abnormal in the manner in which delusions change on suggestion and generally in their extreme nature being either superlatively grandiose or less commonly profoundly melancholic. The general character of the paresis, with tremor distinguishes general paralysis from coarser lesions, where the affection is usually a definite paralysis of one group of muscles. Slurred hesitant speech, however should not be confused with the pseudo-bulbar paralysis and dysarthria which may result from arteritis producing bulbar softening In general paralysis the writing is also of the same character syllables and sentences being omitted, as in speech while the subject matter reveals the delusions and dementia from which the patient is suffering

Unequal, irregular pupils, which react sluggishly or not at all to light, are very suggestive of general paralysis, and the same applies to altered knee-jerks, which are generally exaggerated and sometimes absent on one side only The progress of general paralysis is always steadily downwards Though there may be intervals of freedom from active delirium the underlying disease never gives ground and does not react to anti-syphilitic treatment. In all these it differs, as said, from ordinary syphilitic lesions

Non-syphilitic Affections which may resemble Cerebral Syphilis.—Meningitis due to other causes, such as tuberculosis and meningococci is accompanied by fever and the cerebro-spinal fluid does not give a positive Wassermann reaction.

Neurasthenia and **hysteria** differ in the absence of objective physical signs. If a patient has suffered from syphilis and complains of lassitude, headache, confusion of thought and various sensory disturbances, it is possible that he may think that he is on the verge of a breakdown from

syphilis of the brain. In such a case, undoubtedly the best thing is to have the cerebro-spinal fluid examined. If the result is positive it is an indication to recommence treatment, in any case if it is negative, the patient can be reassured, provided there are no definite physical signs.

Korsakow's disease or polyneuritic dementia due to alcohol can usually be distinguished by the definite signs of polyneuritis. If these cannot be elicited, the dementia differs from that of general paralysis in this, that the patient is conscious of adverse criticism and shows signs of it, while the general paralytic is quite indifferent. Loss of memory is complete and transient in Korsakow's disease, but partial and progressive in general paralysis. The cerebro-spinal fluid is negative as regards lymphocytosis and the Wassermann reaction.

Symptomatic epilepsy with or without dementia, may rouse a suspicion of syphilitic brain disease. If there is no history of epilepsy in childhood, it is always very suspicious of syphilis, and a close enquiry into the venereal history with an examination of the cerebro-spinal fluid is indicated. If the patient is under treatment with salvarsan or similar remedy however it should be remembered that, very rarely this causes epileptiform convulsions.

Jacksonian epilepsy though it may be caused by non-syphilitic focal irritation, is so often due to syphilis that the closest enquiry into the symptoms from this point of view should always be made.

Cerebral tumours not due to syphilis may cause symptoms which deceive the very elect and lead to a diagnosis of general paralysis, owing to the epileptiform convulsions and progressive dementia which they may cause, without symptoms of intra-cranial tumour When the diagnosis rests obviously between gumma of the brain and non syphilitic tumour much depends on the history the result of the examination of the cerebro-spinal fluid, and the effect of treatment.

Arterio-sclerosis, by occluding numerous cerebral ves-

sels, may produce symptoms somewhat resembling those of cerebral syphilis. Thus in addition to mental disturbances there may be apoplectiform attacks followed by hemiparesis, dysarthria, difficulty in swallowing and various forms of aphasia. The condition differs from general paralysis in that the mental condition is characterised by a greater display of emotion. The patient is easily provoked to tears and laughter. He is more conscious of his condition and retains better his notions of time and space. The motor and sensory disturbances are coarser and resemble more closely those due to a syphilitic arteritis. In arterio-sclerosis there are also the bodily signs of the disease, in the form of hardened arteries, high blood pressure, and urinary changes.

CHAPTER XIII

SYPHILITIC AFFECTIONS OF THE SPINAL CORD AND ITS MEMBRANES, AND OF PERIPHERAL NERVES

SYPHILITIC affections of the cord are exactly analogous to those of the brain. At similar periods similar pathological affections occur in cord and brain. Sometimes both cord and brain are affected in the same person, but more often the brunt falls on one or the other.

Spinal Meningitis.—It is probable that, as in the case of the brain, much of the spinal meningitis which occurs is symptomless, though the counterpart of headache may exist in the vague symptoms noted by many observers in the early secondary stage—increase of knee-reflexes, paræsthesia, and a feeling of tiredness as if the patient had been taking too much unaccustomed exercise. Sometimes the symptoms accompanying or even preceding the eruption are much more pronounced and simulate those of ordinary meningitis, with rigidity of the neck and Kernig's sign.

In more severe cases, which are not usual before the third month, the symptoms are more definite. In addition to those mentioned above, stiffness in the neck and back and Kernig's sign, there are severe and insistent pains in the back and sacrum, with numbness, tingling, etc., in the upper and lower limbs. Girdle pain is a significant symptom, and there may also be spasm and cramps of muscles, with tenderness on percussion of the spine, and pain on assuming the erect position.

Bladder troubles are frequent, and there may be also definite paresis of one or both limbs. The knee-jerks vary

greatly from day to day being one day lost, another exaggerated, and so on. Most of the symptoms above noted are due to irritation of nerve roots and analogous to those which occur in cerebral meningitis. In some cases the symptoms may be so severe that they stimulate an urgent search for the cause. In others they may be so slight as to pass almost unnoticed or be put down to rheumatism or neuralgia. It is important that syphilitic meningitis should be recognised early since at this stage it is particularly amenable to treatment.

Unfortunately it is not so often recognised early and, in a period which varies from days to months, the cord is more deeply invaded either by the growth inwards of the gummatous process along the pial sheaths or vessels, or more frequently by syphilitic arteritis and occlusion of vessels.

The commonest site of invasion of the cord is the mid dorsal region, but any other may be affected, and the symptoms naturally differ with the locality and the depth and degree of the infection. When meningitis has spread to the cord in the manner shown, the condition is known as meningo-myelitis.

Meningo-myelitis.—Succeeding on the symptoms mentioned above there is more definite loss of motor power The paraplegia is spastic in nature if the lesion is above the lumbo-sacral region and the deep reflexes are increased early *The superficial reflexes* are sometimes increased and sometimes diminished. Bladder troubles, with loss of control or complete incontinence, are very constant symptoms, and rectal control is often impaired or lost. The sensory disturbances vary greatly from complete anæsthesia to some loss or distortion of sensation to heat or cold touch etc

Instead of complete paraplegia, there may occur paraplegia on one side and anæsthesia on the other the **Brown-Séquard** phenomenon. This may arise from other causes than syphilis, but is usually due to the latter disease.

When the disease is in the **cervical region** there may be

paralysis of all four limbs, preceded or accompanied by radiating pains down the arms. There may also be atrophy of the arm muscles, with reaction of degeneration, owing probably to interference with the anterior nerve roots there. In the lowest cervical and first dorsal segments the sympathetic may be interfered with, resulting in contraction of the pupil and disturbances of the sweat secretion of the face, either anidrosis or dysidrosis. When the lumbo-sacral region is affected, there is generally flaccid paralysis of both lower limbs, with loss of superficial as well as deep reflexes, and marked sensory disturbances. There is also incontinence of urine and fæces, the paralysed bladder simply overflowing Sacral bedsores are particularly apt to occur and the patient often dies, either of cystitis or from septic absorption from bedsores.

Some cases show the symptoms which Erb has ascribed to primary degeneration of the posterior median, ascending cerebellar and crossed pyramidal tracts. The chief features of this are the great spasticity of the gait, with paresis, early bladder disturbances, and slight sensory disturbances. The progress is slow lasting many years, and is interrupted by marked remissions, or even complete arrest. Most of the cases which have displayed these symptoms and have been examined post-mortem have shown meningitis with diffuse myelitis, and there is some doubt as to whether Erb's spastic spinal paralysis can rank as a definite system disease, or is simply meningo-myelitis in one of its variations.

Amongst the many forms which spinal syphilis affecting the supporting and nutrient structures may assume, is that in which there is a very close resemblance of all the symptoms to those of tabes, with lost knee-jerks, lightning pains, ataxy bladder troubles, pupil symptoms, etc. presenting such a close imitation that mistakes are often made. It is probable that many of the rapid cures of so-called tabes are cases of this character The condition is one of meningitis primarily with secondary degeneration

of the posterior columns and it is important to distinguish it from tabes since it differs strongly from the latter in its amenability to treatment. The distinguishing features are as follows. In pseudo-tabes the onset is generally much earlier in the course of the disease than in tabes the symptoms set in more suddenly and progress more rapidly the tendon reflexes vary being lost at one time, regained or exaggerated at another and more marked on one side than the other

Transverse Myelitis.—More severe than the above are those cases in which a definite **transverse myelitis** occurs, due to occlusion of spinal arteries by arteritis. It may be preceded by prodromal symptoms due to meningitis or diffuse meningo-myelitis. The patient rapidly becomes paralysed in his lower limbs and trunk below the level of supply of the affected segment. There is generally also profound loss of sensation, though the heat sense is often retained. Sometimes, on the other hand the sense of light touch only is retained and in still other cases the heat sense is the only one lost. Sometimes again there is a Brown-Séquard phenomenon.

The **bladder and rectal** sphincters are paralysed early and bedsores, which may lead to fatal septic complications are very common. When the anterior cornua are implicated there is superadded the symptoms of anterior poliomyelitis at the corresponding segment.

The **deep reflexes** vary with the site of the lesion. If the dorsal only is affected they are retained or exaggerated, with ankle clonus and Babinski's sign, while a lumbar affection causes their abolition.

The outcome varies considerably and much depends on the promptitude of treatment. If the latter is rapidly effective, there may be apparently complete recovery although in the writer's experience it is very difficult to render the cerebro-spinal fluid completely normal, increase of cells and a positive Wassermann reaction persisting long after the patient has apparently made a complete

recovery Without treatment, or when this is inefficient, the patient may recover somewhat, but this partial improvement is often only temporary and the symptoms are apt to return in all their old severity Naturally if treatment is applied only after degenerative changes are established, there is bound to be a residuum of disability however efficient the eventual treatment may be. The fire may be extinguished, but the house cannot be rebuilt. Some cases are rapidly fatal from cystitis and pyelo-nephritis, or from septic complications resulting from bedsores.

Gummata.—Localised gummata of the dura, pressing on and irritating the cord are very rare, and the same applies to localised gummata of the cord and soft membranes. They may be single or multiple, and are usually associated with diffuse meningitis and arteritis. The focal symptoms of gumma naturally depend on the area affected, and are often buried in those depending on the diffuse meningo-myelitis, which co-exists.

Syphilitic disease of the spine may cause cord symptoms which vary with the nature of the disease. Spinal caries and necrosis may implicate the cord by extension of the process, secondary septic infection, or partial dislocation, but all these are rare. Similarly gummata growing from the bones may produce pressure symptoms and symptoms of irritation.

TABES DORSALIS —The outstanding features of tabes dorsalis are eye symptoms, lightning pains, absence of deep reflexes, ataxia, visceral (particularly bladder) disturbances, sensory disturbances, and changes in the cerebro-spinal fluid.

Eye symptoms consist in pupil changes, transitory ophthalmoplegias, and optic atrophy

Pupil changes are so frequently found in tabes that, in their absence, strong evidence is required from other directions before a diagnosis of tabes can be substantiated. The pupils are generally contracted and fail to react to light, but react in accommodation—Argyll-Robertson

pupil. Sometimes only one pupil is affected, and sometimes instead of contracting to light, it dilates slightly after a second or two (paradoxical pupil) A pupil which is merely sluggish is not necessarily pathological, especially when it is also sluggish to accommodation. Very often the pupils are irregular and irregularity of the pupil often precedes the more typical signs.

Paralysis of one or a group of external muscles of the eye, producing squint and double vision is common. It is often transient, but may persist, and the external rectus is most often affected. Sometimes ptosis is the only symptom and this again may be transient or permanent.

Optic atrophy is a symptom of tabes which is peculiar in this respect that for years it may be the only symptom. It is very often the first sign for which the patient seeks advice. The field of vision becomes gradually limited from the periphery to the centre, with loss of colour vision, and the patient becomes blind in from six to eighteen months. The difference between this form of dimness of vision and that due to syphilitic meningeal and arterial changes is that in the former the usual event is a central scotoma or hemianopsia. Mott emphasises the fact that although lightning pains disappear with the onset of optic atrophy and the whole disease so often seems to be arrested, yet optic atrophy is very often the precursor of general paralysis. Optic tabes may last for twenty years before any other symptom appears.

Sensory disturbances are of the most varied kind, depending as they do on irritation and destruction in varying degree of separate posterior nerve roots and their projections in the cord. The result is that, though patients exhibit the same type of symptom, hardly two patients agree in the details. Lightning pains are amongst the commonest and earliest symptoms of tabes, but since they simulate neuralgia, rheumatism, and gout, all of which we meet so commonly in everyday practice, their true cause often remains unrecognised for years. It is fortunate for the

patient if he happens to consult his doctor when the latter is fresh, and alive to the significance of these pains, since they may lead to the discovery of the true cause by a timely examination of the cerebro-spinal fluid. The most characteristic is a sharp stabbing or burning pain over a very small area of the skin or deeper structures of any part of the body head, or limbs. It is a pain which comes and goes in a flash, lasting in this recurring manner anything from a few minutes to many days, and then completely disappearing for periods of time which vary from days to weeks, or longer The pains may be mild, affecting only one spot, or of the greatest intensity radiating over the whole body and requiring morphia for their alleviation. As said, they are often mistaken for other affections, such as sciatica when the pain shoots into the back of the leg rheumatism when it starts in the joint or angina when it shoots down the left arm. The skin over the painful area becomes hyperæsthetic, so that, if many areas are affected, the patient may not be able to bear the weight of the bed-clothes. Closely associated is the girdle sensation or feeling of a tight band round the chest.

Apart from the paroxysms of pain, the patient may complain of various sensory disturbances affecting the skin of various parts of his body such as numbness, tingling "pins and needles" or a feeling as of water trickling over the surface. One of the commonest of these is the well-known feeling of walking on wool.

The varying stages of irritation and destruction of the several nerve roots affected account for the varying zones and patches of anæsthesia, hyperæsthesia, and analgesia which may be found on examination of the skin. Loss of sensation to light touch is very often found early at the level of the nipple in front and lower angle of the scapula behind, and the *same* zone may contain patches of deficient sensibility to pain while just above and below it may be zones of hyperæsthesia. The inner side of the arm and forearm, with ring and little fingers, are

much more affected than the outer The leg shows all degrees of loss of sensation to touch and pain, from *anæsthesia of the sole* or peroneal surface of the lower part of the leg to affection of the whole leg The anal, perineal and genital regions may be similarly affected, and there may be loss of testicular sensation. The perception of heat and cold is not affected so much as that of touch and pain. There is often delay in response to stimulus of any kind and it may also be incorrectly localised.

Crises.—Closely associated with lightning pains are various crises, gastric, laryngeal, bladder and rectal, of which the commonest are gastric. Like lightning pains, they may be the only signs for years, and their misinterpretation may lead to the performance of abdominal operations.

Gastric crises are the most frequent. They are characterised by *attacks of pain and vomiting* which may be slight, amounting to nothing more than mild retching or last for days and be so severe that the patient cannot retain even water in the stomach. As said, the pain and other symptoms may be so severe that the abdomen may be opened in the belief that some surgical tragedy has happened therein. As there is always a zone of partial or complete anæsthesia corresponding to the distribution of the fourth and fifth dorsal segments (level of the nipple), it would perhaps be well in such cases to make a practice of testing out this area, as well as the pupillary light reflex, before sending for the surgeon.

Laryngeal crises are manifested by attacks which simulate laryngismus stridulus, or whooping cough. There may be the most intense dyspnœa, but death in an attack is rare. They are often associated with increased frequency of the pulse.

Rectal symptoms are moderately common crises being manifested by severe pains and tenesmus. There is often constipation and often, too, loss of control over the sphincter

so that the patient will have an involuntary motion when commencing to urinate.

Bladder troubles are important and often commence early. They may be the first symptoms to attract the patient's attention and should always stimulate an investigation into the state of the central nervous system. Difficulty in commencing the flow is followed, at a later stage, by difficulty in emptying the bladder completely with its sequelæ in the shape of cystitis, etc. In addition to these troubles, there is often also an inability to control the urinary sphincter so that urine escapes into the urethra and there is at once an urgent desire to micturate. Bladder crises with urgent pain in the lower abdomen and in the urethra, are not uncommon.

Impotence is usual in both tabes and general paralysis. It is often preceded by a period of increased sexual desire and this may persist after the patient has become completely impotent. The testicles tend to atrophy.

Superficial reflexes closely correspond with areas of anæsthesia. Usually the plantar reflex is lost early and the cremasteric may or may not be retained while the epigastric generally remains until a late stage. The superficial reflexes may be exaggerated in the early stages before there is any interference with sensation.

Deep Reflexes.—The knee-jerk is most constantly lost, and frequently long before there is any ataxia. Sometimes it is present on one side and not on the other, a sign which is ominous of present or imminent tabo-paralysis. The Achilles tendon jerk may be present or absent, the latter sometimes when the knee-jerk is present. The triceps is generally lost after the knee-jerk has disappeared.

Loss of muscular tone occurs in all cases to a greater or less degree. It is demonstrated by keeping the knee extended and flexing the thigh on the body, as in eliciting Kernig's sign. The effect is the opposite to Kernig, and in advanced cases the patient's toe can be made to touch his forehead. Another method of demonstrating it is to press

the knee down flat on the bed and then raise the heel, when the degree of hypotonus can be estimated by the size of the object which can be placed under the heel Another effect of loss of tone is foot-drop which may be aggravated by the weight of the bed-clothes into an extreme talipes equinus

Inco-ordination and the tests required to elicit it are too well known to demand any detailed description The legs are usually affected first and the patient's attention is often drawn to his condition for the first time by difficulty in walking in the dark, or upstairs or over uneven ground or a tendency to fall into the basin when washing his face With the commencement of inco-ordination it is possible to elicit **Romberg's sign**, the patient being unable to stand with his feet together and his eyes shut. There is an increasing tendency to stagger on turning round and the patient walks with a wider and wider base as the disease progresses, the feet being thrown out too far and too widely and brought down with a stamp. He requires more and more assistance in walking and eventually becomes bedridden

Inco-ordination of the arms is demonstrated by making the patient touch his nose or an ear quickly with the tip of a finger while his eyes are shut Rarely inco-ordination of the arms precedes that of the legs.

Joint and Bone Troubles.—Spontaneous painless fractures sometimes occur in tabes and tabo-paralysis More important is the joint affection known as Charcot's joint (see p 104) which may be the first sign which *causes the* patient to seek advice Over worked joints are more likely to be affected than others hence its frequency in charwomen A good example of this tendency of over-worked joints to suffer was often shown by Mr C. H. Mills at Rochester Row in a patient who was a stoker His right elbow was affected and he also suffered from perforating ulcer of the ball of the left great toe both of them parts which were subjected to particular stress

by the patient's occupation. The knee is most frequently affected then the hip, shoulder elbow and wrist, while the ankle, vertebral, and finger joints suffer comparatively rarely

Perforating ulcer may also be the first sign for which the patient seeks advice It often commences in a corn and usually on the sole of the foot or the ball of a toe especially the big toe There is suppuration, and at the bottom of the ulcer it is generally possible to find carious bone.

Local sweating of certain skin areas such as the soles palms, or one side of the head thickening and furrowing of nails and pigment changes of skin and hair have also been described.

Cardiac disease and aneurism are common in tabes, an argument against the theory that these diseases are due to a special neuro-toxic virus.

Tabo-paralysis, or the combination of tabes and general paralysis often follows on tabes It may be apprehended in a patient suffering from tabes who has unilateral loss of knee-jerks attacks of epilepsy or apoplectiform attacks, or attacks of migraine. The occurrence of cerebral symptoms in a patient suffering from tabes, however does not necessarily mean tabo-paralysis. The lightning pains and crises or the mental depression resulting from the knowledge that he is suffering from such a disease, may upset the balance of a patient who is mentally unstable. In these cases the cerebral symptoms usually differ from those of tabo-paralysis in the character of the delusions, which are fixed, not changeable on suggestion They are, too, of a more melancholic type and contrast in this respect with the grandiose delusions of the paralytic. As mentioned, optic atrophy is more often followed by general paralysis than other forms of tabes.

Duration and Prognosis.—If detected early and the patient is relieved of stress and strain tabes may remain stationary for many years, or thoughout life. Those who develop

optic atrophy are particularly liable to arrest of all other symptoms for at any rate many years The average duration is about ten years but many cases last for twenty years or longer Death is usually due to such intercurrent affections as cystitis and its sequelæ to broncho pneumonia and sometimes to the frequently associated syphilitic cardiac disease or aneurism. Some also become paralytic and then the course is more rapid the patient dying in five years or less

DIAGNOSIS OF SYPHILIS OF THE SPINAL CORD —In any case where there was obviously disease of the spinal cord such as paraplegia ataxia and so on one would naturally enquire into the history and symptoms from the point of view of syphilis and eventually an examination of the cerebro-spinal fluid would probably settle the diagnosis. It is however in the early stages of spinal disease, before these symptoms appear that a correct diagnosis is most important—in the stage, in fact where the symptoms are chiefly irritative and timely treatment can stop the process before much permanent damage has been done The symptoms of the irritative stage are however often so vague and indefinite and so imitative of affections with which we are dealing every day that in the routine of every day work, they are apt to be overlooked even if the patient pays sufficient attention to them to seek medical advice

In syphilis of the supporting structures the most striking features of this stage are those indicating irritation of nerve roots—severe pain perhaps worse at night radiating along an intercostal space and down the limbs cramps of the limbs stiffness of the back and perhaps Kernig's sign but without fever Also the facts that these symptoms come and go and that one set of symptoms improves while another makes its appearance are very suggestive of a syphilitic lesion Examination may then show that the patellar reflex is present on one day and absent on another and syphilitic residua may be found about the body At a further stage the Brown-Séquard phenomenon

or the fact that the symptoms, though imitating one or more of them, are not true to the type of any of the non specific spinal complaints would strongly suggest syphilis

In tabes and tabo-paralysis, also the early symptoms are often overlooked the lightning pains being mistaken for rheumatism or neuralgia, gastric crises for dyspepsia, laryngeal for asthma and so on. Difficulties in micturition and impotence generally succeed in focussing the attention on the possibility of syphilis being at the root of the trouble, but even here it is possible to forget syphilis The writer recollects being asked to see a case of retention in a patient suffering from gonorrhoea quite an ordinary case, apparently of a comparatively common complication of gonorrhoea. The suspicious feature however was that the patient had allowed his bladder to reach his umbilicus without any protest and the stony was such that the urine merely dribbled through a full-sized catheter Enquiry elicited a history of syphilis twelve years previously but the knee-jerks were present the pupil reaction was merely sluggish, and the Wassermann reaction of the blood negative An examination of the cerebro-spinal fluid however showed 50 lymphocytes per c.mm. and a positive Wassermann reaction with some excess of globulin, and the outcome proved that the cause of the bladder trouble was not gonorrhoea, but tabes This case illustrates the importance of examining the cerebro-spinal fluid which should never be omitted when there is the least suspicion of central nerve disease.

It is important to distinguish between pseudo-tabes and tabes, since the former is very amenable to treatment and the latter not. The distinctive features of these have both been discussed but the following table which is a slight modification in regard to the fluid examination of one by Mott (*A System of Syphilis* by D'Arcy Power and Keogh Murphy vol. iv), will be found useful in distinguishing these diseases from one another and from ataxic peripheral neuritis.

I Tabes Dorsalis	II Pseudo-Tabes Syphilitica	III Ataxic Toxic Peripheral Neuritis
1 Average time between syphilitic infection and onset of symptoms ten years. Only slight signs if any of syphilitic residua as a rule. Onset and course usually slow insidious, and progressive.	1 Average time between syphilitic infection and onset of symptoms *eighteen month* to two years. Generally signs of syphilitic residua. Onset and course usually rapid and subject to regressions and remissions.	1 A history of some toxic condition, *e.g.* diphtheria, typhoid, lead, *diabetes, and* particularly alcohol.
2. Pupil phenomena and strabismus common. Argyll Robertson pupil rarely absent.	2. Pupil phenomena and strabismus common, but Argyll Robertson *pupil rare.*	2. The pupils are as a rule, not affected. In diphtheria there is paralysis of the muscle of accommodation; the light reflex is preserved.
3. Primary optic atrophy not uncommon.	3. Optic neuritis and post neuritic atrophy not uncommon. A unilateral central scotoma, the other eye remaining healthy is an indication of a retrobular neuritis affecting the papillo-macular bundle of *fibres; it indicates* gummatous meningitis.	3 There are no changes in the fundus.
4 *Bladder troubles* common, and visceral crises not infrequent.	4 *Bladder troubles* common.	4. *As a rule,* there are no bladder troubles unless there is dementia.
5. Knee-jerks absent as a rule.	5 *Knee-jerks* variable, one day absent and then returning.	5. The knee-jerks may be lost present, or exaggerated.
6. Lightning pains in the limbs. No stiffness in the neck and spine. Girdle sensation may be present and thoracic anæsthesia to light touch is frequently present *in the first stage*	6 Spinal pain tenderness, and stiffness; the pains lancinating, radiating from the pin down the limbs. Girdle sensation and thoracic anæsthesia very frequently present	6 There is pain and tendern ss of the limbs, and the gait is ataxic; there may be paresthesia; often the muscles may be wasted and give the reaction of degeneration. There is usually foot drop and wrist drop.
7 Moderate *increase* f lymphocytes in cerebro-spinal fluid.	7 *Usually a* consider ably greater increase f lymphocytes than in t bes	*No increase* of lymphocytes in cerebro-spinal fluid.
8. Positive Wassermann reaction of blood in most cases; simila reaction practically always given by fluid and usually stronger than in pseudo-t bes	8 Positive Wassermann reaction of blood i most cases reaction of fluid usually present but not so strong as a rule a in tabes.	8. Wassermann reaction f blood and fluid, negative.

Syphilitic myelitis has to be distinguished from that due to other causes by the history the presence of signs of syphilis elsewhere and the examination of the cerebrospinal fluid The same would apply to syphilitic poliomyelitis due to arteritis of a branch of the anterior spinal artery if this were not accompanied by other signs of syphilitic myelitis

Acute transverse myelitis may be due to pressure of tumours, spinal caries, and so on besides syphilis The truest guid to the diagnosis is the condition of the cerebrospinal fluid, and the same applies to the diagnosis from disseminated sclerosis. Naturally a history of syphilis may help, but syphilitic disease is so imitative of other lesions that without a fluid examination, the diagnosis cannot rest upon a sure foundation

Landry's paralysis is distinguished from acute ascending syphilitic myelitis by the absence of sensory symptoms, or any tendency to form bedsores

Neurasthenia.—Many highly strung syphilitics become neurasthenic and may complain of symptoms which lead to the suspicion of syphilitic disease of the central nervous system. The patellar reflex is increased and equal on both sides, sensation is unimpaired and there are no pupil symptoms It is possible also that no changes may be found in the spinal fluid

Syphilitic Affections of the Nerves

Apart from affections of the cranial nerves which have already been mentioned in connection with meningitis other syphilitic affections of nerves are not of any great importance Neuralgias of various types and polyneuritis which have resolved under anti-syphilitic treatment have been described but they are really very rare and call for no further comment

CHAPTER XIV

THE VENEREAL DISEASES OF WOMEN

The venereal diseases of women are essentially similar to those of men and it is necessary only to deal with a few peculiarities which mainly depend on the different anatomy of the genital organs

GONOCOCCAL AFFECTIONS —It is possible that in most cases gonorrhœa is a mild disease in women and the symptoms are overlooked by the patients On the other hand it may be so acute that the patient is seriously ill and miserable for some days even if the disease does not cause dangerous complications Apart from this gonorrhœa must always be regarded as a serious disease in women for the reason that although its start may be mild its end may be deadly because of the infection ascending to the uterus and pelvic organs In acute cases the whole vulvar orifice is œdematous inflamed and excoriated and the genitals bathed in a purulent discharge which hides the parts bearing the brunt of the infection As a rule, these are the uterine cervix, the urethra and adjoining follicles and Bartholin s glands

The course of the disease is long and chronic after subsidence of the acute symptoms and is usually interrupted by remissions and exacerbations These coincide with the varying states of vascularity of the uterine mucosa, which determine the amount of fresh nutriment supplied to the micro-organisms My own experience in this respect has shown that prostitutes are more infectious just after the menstrual flow and in women who are

examined regularly I have detected gonococci more frequently at this time than at any other The course of the disease and its effect on the patient are also determined by its complications These may follow rapidly on the acute stage, or may flare up months or years after the disease has become chronic.

The most important complications from the point of view of health are gonococcal endometritis and metritis, salpingitis ovaritis, and peritonitis These may appear for the first time after some menstrual period or the birth of a child or as said they may follow rapidly on the primary infection They are acute, subacute, or chronic from the first.

Amongst other complications one of the commonest is gonorrhœal proctitis, owing to the bathing of the anal region with discharges during the acute attack and later at each menstrual period Its symptoms have been considered (p 68)

Infection of Bartholin's glands and the follicles around the urethra are also common accompaniments, and contribute their quota to the factors which make for chronicity and continued infectivity

As a local complication which is indirectly due to gonorrhœa, may be mentioned venereal warts, the papillomatous growths which have already been considered in connection with the male genitals. They are due to the irritation of discharges and, since the female genitals favour moisture and retention of discharge, they are much more commonly a prominent feature in women than in men The whole area of the external genitals and perineum may be covered by them in the form of one large cauliflower-like mass.

The metastatic complications are similar to those which occur in men.

The diagnosis of gonorrhœa in women requires the methodical examination of the various parts affected It can never be considered settled until bacteriological in

vestigation has demonstrated the presence of the gonococcus The various orifices must be examined in turn for any exudate of pus and it is important in taking specimens to avoid contamination with vaginal secretion since the flora of the vagina are many and varied and in a con



Fig 41. Examination of female urinary meatus. (By permission from Luys.)

taminated specimen it may be difficult or impossible to pick out the gonococcus from the mixture.

Commencing with the urethra, the meatus is cleansed and examined It may appear pouting red and oedematous, with a profuse discharge oozing from it, or it may be necessary to apply pressure to the inferior wall of the urethra through the vagina in order to demonstrate the presence of a discharge (fig 41) The follicles around

the urinary meatus are often infected appearing as little red spots, pressure on which causes a tiny bead of pus to exude

One or both Bartholin's glands may be inflamed acutely or chronically In the acute stage the mucous membrane covering the affected gland is tense, red and shining and the swelling of the gland may be felt by grasping the labia between finger and thumb The size and tenderness of the swelling depend on the age of the infection and the acuteness of the process A small red point may indicate the position of the orifice and if this is patent or a fistula has formed pressure on the gland in the manner indicated causes the exudate of greenish yellow pus, which may be foetid

The vagina, especially the posterior fornix, may show varying degrees of catarrh and erosion In the acuter cases there is a purulent discharge, and considerable discomfort from excoriation of the external genitals by the discharge

Examination of the cervix through a speculum shows in gonorrhœal cervicitis varying degrees of inflammation, according to the acuteness of the process In the acute stage the lips are swollen everted and excoriated while the discharge is definitely purulent In chronic cases the cervix may not appear particularly abnormal, and the discharge which appears at the external os uteri varies from muco-purulent to a glairy mucous Such conditions are often seen in women who have never suffered from gonorrhœa, and only microscopical examination can determine the nature of the catarrh. Failure to find the gonococcus on one occasion is insufficient to exclude gonorrhœa, as they appear and disappear in an irregular manner Probably as mentioned, the best time to catch the gonococcus in the cervical discharge is just after the menstrual flow has ceased

Acute subacute, and chronic endometritis, salpingitis, ovaritis, and pelvic cellulitis due to infection by the gonococcus are apt to follow the birth of the first child

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Acute subacute and chronic endometritis, salpingitis, ovaritis, and pelvic cellulitis due to infection by the gonococcus are apt to follow the birth of the first child

They hardly differ symptomatically from similar conditions due to other micro-organisms but the gonococcus is so often the cause of such affections that they should always arouse a suspicion of gonorrhœa In their acute stages they are associated with more or less constitutional disturbance—fever and malaise There are discomfort and pain in the lower abdomen and examination shows enlargement of the affected organs, with more or less tenderness on palpation In later stages, indefinite pelvic trouble with chronic ill health menstrual troubles sterility or extra uterine gestation may be the first to provoke the necessary examination which eventually incriminates the gonococcus

It may be difficult to determine the connection between a pelvic complication and the gonococcus since this may not appear in the discharge from the cervix but great help in the diagnosis may sometimes be obtained from the use of a gonococcal vaccine to provoke a focal reaction. Having gauged the signs local and general by careful examination a dose of say 25–50 millions of an unheated gonococcal vaccine is administered to a subacute or 100–150 millions to a chronic case In gonococcal disease the result is an exacerbation of all signs and symptoms. A rise of 1 0 F or more with accompanying increase of swelling and discomfort after the administration of a dose of gonococcal vaccine would be significant of a gonococcal affection

Syphilis

Primary syphilitic sores of the external genitals may be difficult or impossible to discover and on account of their greater liability to contamination septic processes may change their characteristics so greatly as to make the diagnosis by naked-eye examination very uncertain. For this reason it is particularly important to examine microscopically the serum exudate of any erosion which may be discovered regardless of its appearance.

On the external surface of a labium majus may be found a syphilitic sore, raised on a plateau covered with a crust or with dark red granulations and surrounded by a typical rampart of indurated tissue which cuts off the lesion from the surrounding tissues and makes it appear

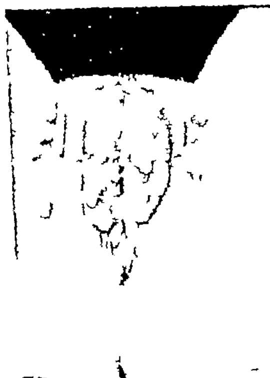


Fig 43. Indurated œdema of labia, with numerous condylomata on adjoining surfaces

as if it were a foreign body let into them On the mucous surface the corresponding lip of each labium may be occupied by a sore which is oval or circular dark red and glistening with the serum which oozes from its surface The stiff paper-like induration of this sore can be appreciated by

taking it delicately between finger and thumb laid on opposite edges and trying to buckle it

In the **posterior commissure** the sore may be simply an indurated fissure or furrow

One characteristic which may or may not be accompanied by a visible lesion is practically diagnostic of syphilis. This is the **indurated œdema** (fig 4°) which has already been described in connection with the penis and scrotum. It is much more common in women than in men, and affects one or more labia which become brownish red or livid and swollen with a tough œdema which contrasts with the softer doughy œdema accompanying purely septic processes

On the **cervix uteri** the primary syphilitic sore is found as a dull red slightly raised erosion with a well-defined areola affecting one or both lips The induration is naturally difficult or impossible to make out and the best diagnostic measure is the microscopical examination of the exudate

In the **vagina** a primary sore may be impossible to distinguish from an ordinary erosion and here also the microscope is invaluable

After examining the genitals the **anal region** should be looked over carefully for any indurated fissures or sores which may prove to be primary lesions

All varieties of **secondary lesions** may be found on the external genitals but broad condylomata (fig 43) occur much more commonly in women than men They affect the mucous surfaces of the labia the internal surfaces and contiguous parts of the thighs and extend between the buttocks to the parts around the anus The greater tendency of women to these lesions is doubtless due to the moister state of the affected regions and longer retention of irritating secretions about them

Fistulæ connected with breaking-down gummata of the rectum and periproctal region may be found opening on the vagina Gumma of the vagina usually occurs by

extension from the rectum and around the openings of the fistulæ may be extensive ulcerations The diagnosis is established by the history and accompanying signs of gummatous disease of the rectal tissues (p 69)

Soft chancres affecting the female genitals have the general characteristics of similar lesions about the male organs

The **glands** of the groin present the same affections a



FIG 43 Condylomata of labia, thighs, and perineum.

in men In lesions of the vagina and cervix the inguinal glands would not be affected

The **mammæ** may be the site of one or more primary syphilitic sores which may be situated on the nipple or on the breast itself The sore may be a dull-red circular erosion or more definitely ulcerated and covered with a crust In some cases it may appear however as a tough indurated fissure when a cracked nipple has become infected The induration and comparatively slight pain the colour which contrasts definitely with that of the

surrounding tissues the circumscribed nature of the sore and the early enlargement of axillary glands serve to arouse the suspicion of syphilis and lead to a microscopical examination

Moist papules are common under the mammæ in the secondary stage especially when these are pendulous

Diffuse pain and tenderness in the breasts are common in the secondary stage and the constitutional disturbance is greater then than in men

Circumscribed gummata of the breast are comparatively rare They appear as one or a number of round elastic tumours the skin over which is at first freely movable. If a gumma comes to the surface the skin becomes reddened adherent to the tumour and breaking eventually gives rise to a gummatous ulcer of the usual type Gumma differs from scirrhus in its tendency to soften rather than harden in the centre in absence of pain and in reacting quickly to anti-syphilitic treatment

Diffuse gummatous infiltration causes uniform enlargement and hardening of the breasts The enlargement is comparatively painless and reacts well to anti-syphilitic treatment

The syphilitic manifestations which affect the remainder of the body differ from those found in men only in the greater prevalence of certain types Thus leucoderma (p 119) and phlebitis causing the form of erythema nodosum mentioned on p 90 are commoner in women Alopecia is a more prominent and distressing feature and the secondary syphilitic lesions of women are more frequently of the moist type than those of men The connection between syphilis and miscarriage is well known The tendency to miscarriage is more pronounced in the earlier years of infection and is preventible by treatment

CHAPTER XV

GONOCOCCAL AND SYPHILITIC AFFECTIONS OF INFANTS AND CHILDREN

GONOCOCCAL AFFECTIONS

Ophthalmia neonatorum is well known as a possible consequence of birth through an infected vagina. The symptoms come on within a few days of birth and are similar to those already described in connection with adults (p 149) Ophthalmia may rarely be due to other infections but these are milder and more amenable to treatment The diagnosis is effected by finding the gonococcus in the eye discharges If the eye is saved the cornea may be marked by opacities. Mr Bishop Harman has drawn attention to a valuable sign of past ophthalmia neonatorum in the form of nystagmus This is attributed to the fact that owing to the temporary blindness caused by the ophthalmia within a few days of birth, the macula does not receive the stimulus which is necessary to its development and the eye never acquires the power of fixing objects

Vulvo-vaginitis of little girls is a catarrhal inflammation of girls under the age of puberty which results from contact with infected towels, sponges, napkins, bath-water etc the gonococcus being, perhaps the most frequent source of infection Gonococcal vulvo-vaginitis is a pest of children's institutions, which is liable to spread through a ward with great rapidity after the admission of an infected girl. It is also important from the point of view of the precautions to be taken when the mother of a family or

a nursemaid, is known to be infected The disease usually remains confined to the vulva and vagina, but the uterus and pelvic organs may become infected especially if the vaginitis is treated by indiscriminate douching The signs and symptoms are those of the disease in adults and it is usually very intractable

SYPHILIS

Congenital syphilis manifests itself in the great majority of cases within the first three months The statistics of Still and of Diday show that in 20? cases symptoms appeared in the first month in 140 in the second month in 71 and in the third month in 31 while all but three of the remainder first showed them within the first year Occasionally symptoms are delayed until much later in childhood seven years or more but this is rare After seven years the age of puberty is the next danger period for recurrences to appear

Skin lesions are not common just at birth but occasionally a child is born with a bullous eruption which affects, especially the palms and soles (**syphilitic pemphigus**).

The eruption consists of pustules resting on dark red bases each of which is seen as an areola around the unbroken pustule The latter often breaks quickly leaving a brownish red eroded surface which is covered with scales or crusts. Syphilitic pemphigus is distinguished from ordinary pemphigus neonatorum by being present at birth and affecting the palms and soles Also by the fact that the bullæ contain the spirochæta pallida in large numbers

The commonest rash in infants is the maculo-roseolar and the macules are most abundant on the napkin area, about the nose and mouth and on the palms and soles. In places where they are exposed to irritation they often run together into roundish areas which are glazed dull red, and tend to scale very profusely especially on the palms and soles Scattered macules can usually be

found around the margins of the erythematous patches and the syphilide often shows an annular formation as in the recurrent types of acquired syphilis (Plate XV) At margins where skin and mucous membranes meet



FIG 44. Radiating scars of angle of mouth and lower lip. (Photograph kindly lent by Captain A. M. Davidson)

such as the lips and the anus, ulcerative fissures or rhagades sometimes form and eventually leave scars which radiate outwards from the orifice. A good example

of this is the scars radiating from each lip upwards towards the nose and downwards over the chin (fig 44) which are often seen in congenital syphilis Sometimes a papular eruption is associated with the above and condylomata and moist papules occur about the anus on the scrotum, and at the flexures where the areas are always moist with sweat When these papules form on the palms and soles, they may be raised on the surface into minute pinhead blisters and subsequently show lamellar scaling

At a later period in the first year or possibly within the first two or three years **cutaneous gummata** may appear as nodular subcutaneous infiltrates varying in size from a pea to a walnut These break down and discharge their mucoid contents through small central openings forming the syphilitic furuncles of Barlow They are found most frequently on the upper and outer part of the thighs. Very rarely lesions may become phagedenic, and the resulting destruction of tissue causes much disfigurement

The skin frequently shows characteristic changes, especially in severe cases becoming discoloured wrinkled and papery The brownish yellow tint of the skin and the wrinkled face then combine to produce the characteristically withered old-man appearance of congenital syphilis.

Changes in the nails generally coincide with the early skin eruption In the milder affections the nail becomes opaque and irregular and may be narrowed at its base It is usually shed and its successor may take on the same appearances depending on the success of the treatment. In a more acute form of onychia a serous exudate escapes from under the sides of the nail which is loosened and shed

The **hair** of the scalp may be shed more or less extensively especially over the back and sides and loss of the eyebrows is very suggestive of syphilis On the other hand the hair may be unusually abundant at or shortly after birth so much so that this condition has been spoken of as the syphilitic mop It is a sign which



Annular squamous syphilide, leg and thigh of an infant. Shows also the well-defined border of the syphilide at the margins of the sole.

occurs apart from syphilis and is of no diagnostic value in the absence of other signs

The mouth may show mucous patches similar to those found in acquired syphilis As mentioned the palate may be perforated in childhood or the lesion may be delayed till well into adult life. The tongue may show gummatous ulceration of its dorsum, or there may be diffuse glossitis with leucoplakia (fig 30 p 187) In young adults the presence of scars occupying the soft palate, pillars of the fauces and posterior pharyngeal wall with deformity of these parts, may be valuable evidence of congenital syphilis when other signs are absent These scars are simply the remains of old gummatous ulcerations and may equally result from acquired syphilis but they are fairly late manifestations and the youth of the patient may put out of court any possibility of the infection being acquired

The **teeth** of congenital syphilis have already been described (see p 147).

Nasal and laryngeal affections are particularly important in connection with the diagnosis of congenital syphilis, as they are so constant particularly the nasal. A chronic nasal catarrh becomes evident from the earliest stages, being sometimes present at birth in the form of the well known "snuffles. The amount of discharge may be very little and mucous in character or abundant and purulent or mucopurulent, and sometimes stained with blood The discharge like others from the lesions of infants suffering from congenital syphilis, contains the spirochaeta pallida abundantly and is highly contagious In severe cases the chronic obstruction with resulting negative pressure within the nares results in some sinking of the nasal arch, and saddle-nose remains as a permanent stigma of the disease (fig 28). This may also follow destruction of nasal bones

Gummatous ulceration of the nasal floor may lead to perforation of the hard and soft palate which may occur

a in the adult. According to Hutchinson it occurs most often at the age of five months and may be uni- or bilateral. It is very amenable to treatment but it must be remembered that treatment may be delayed until irreparable damage has been done

Interstitial keratitis has already been described in connection with the examination of adults (p 153) though its most frequent incidence is between the ages of six and twelve.

Affections of the Ears.—Otitis media and otorrhœa may occur in connection with the chronic rhinitis found in early infancy They may be purely syphilitic, or complicated with pyogenic infection The discharge is highly infectious, an important fact to remember in dealing with these patients The whole middle ear and labyrinth may be destroyed and the child become a deaf-mute

A serious consequence of congenital syphilis is the syphilitic affection of the internal ear which occurs between the ages of eleven and twenty and quickly leads to complete deafness without preceding symptoms. It occurs more often in females the proportion being put by various authors at from two to four females to one male It is often associated with keratitis, usually commencing rather later than the eye complaint. Its onset is rather sudden sometimes with tinnitus and vertigo more commonly without and as a rule both ears become quickly affected though one may commence before the other The patient rapidly becomes hopelessly deaf.

The **spleen** is usually moderately enlarged so that it is palpable, but definite gumma is very rare. Enlargement of the spleen would be regarded as a confirmatory sign though absence of enlargement would not negative syphilis

The **liver** is commonly found to be diseased in those cases which die *in utero* In *infants* who are born alive symptoms of liver disease may or may not develop during the first few months, in the form either of diffuse inter

at any time from the age of two years to adolescence or later

Laryngeal disease manifests itself in the child's hoarse cry As in the nose there may be simply inflammatory swelling or on the other hand considerable ulceration. In the latter case the laryngeal symptoms are more severe and there may be considerable interference with respiration which may lead to suffocation In later childhood and in adolescence definite gummatous tumours may form leading to increasing difficulty in respiration stridor and all the other symptoms of laryngeal or tracheal obstruction

The Lungs.—Chronic changes may be found in the lungs of stillborn infants and those dying shortly after birth

It may also occur in late infancy and as Still has suggested there is good evidence for supposing that it may be responsible for much more of the fibroid disease of the lung which is found in childhood than is commonly supposed

Localised gummata have also been found in the lung from a very early stage

The **eye affections** of congenital syphilis are very important, both from the point of view of their frequency and their serious effects on the sight

Choroiditis and iritis often occur in the early months, having been found as early as the first day They have also been mentioned in connection with interstitial keratitis *affecting congenital syphilitics in late childhood and adult life (p 159)*

The *signs* of choroiditis are irregular white patches surrounded by sharply pigmented borders which are irregular in contour Irregular heaps of pigment are also found at the borders of the white patches as well as separately from these and there are opacities of the vitreous

Iritis differs from the adult form only in the absence of the more severe symptoms of acute inflammation It is accompanied by free effusion of lymph and there is the same danger of occlusion of the pupil synechiæ, and so on

as in the adult. According to Hutchinson it occurs most often at the age of five months and may be uni- or bi-lateral. It is very amenable to treatment but it must be remembered that treatment may be delayed until irreparable damage has been done.

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A serious consequence of congenital syphilis is the syphilitic affection of the internal ear which occurs between the ages of eleven and twenty and quickly leads to complete deafness without preceding symptoms. It occurs more often in females, the proportion being put by various authors at from two to four females to one male It is often associated with keratitis usually commencing rather later than the eye complaint. Its onset is rather sudden sometimes with tinnitus and vertigo more commonly without nd as a rule both ears become quickly affected though one may commence before the other The patient rapidly becomes hopelessly deaf

The **spleen** is usually moderately enlarged so that it is palpable but definite gumma is very rare. Enlargement of the spleen would be regarded as a confirmatory sign, though absence of enlargement would not negative yphilis

The **liver** is commonly found to be diseased in those cases which die in utero In infants who are born alive, symptoms of liver disease may or may not develop during the first few months, in the form either of diffuse inter

stitial hepatitis or as definite gumma. In the former case the liver is moderately enlarged smooth, and perhaps a little firmer than usual There may be jaundice or more rarely ascites Gummata are usually multiple They are not generally recognised in early infancy but in later childhood say from the age of six years may be felt as multiple bosses on the surface of the liver

The **kidneys** are liable to show the same changes as in the acquired affection and cases of parenchymatous as well as interstitial nephritis have been reported from the age of a few weeks to eighteen years It has been suggested that this affection may have some relation to the chronic interstitial nephritis which is sometimes found in children and young adults

Paroxysmal hæmoglobinuria is very frequently if not always the result of congenital syphilis and it is possible that Raynaud's disease which is so commonly associated with this affection in adults may very often have the same foundation

Gummatous infiltration of the testicles, similar to the same affection in the acquired disease may be found at a very early age a few weeks or months or may occur much later It is practically the only cause of enlargement of the testicle *under the age of five months* The enlargement may be diffuse or localised or both as in the adult.

The **bones** and **joints** often show changes which are important both from a diagnostic point of view and from that of the future welfare of the child

Syphilitic epiphysitis is an affection of the first few months of life and affects the long bones and ribs especially the distal ends of the arms It is distinguished in its early onset from infantile scurvy which occurs later The chief characteristic is rapid loss of movement of the affected limbs and acute tenderness is generally manifested by the child screaming when the limb is moved On account of the loss of movement the affection is called syphilitic pseudo-

paralysis The bone is usually thickened at the epiphyseal line, though absence of thickening or even of pain does not put syphilitic epiphysitis out of the question Occasionally definite separation of the epiphysis may occur and sometimes too suppuration leads to secondary infection of the joint Syphilitic epiphysitis is very amenable to anti-syphilitic treatment but may relapse if this is stopped too soon

Its *diagnosis* rests on the characteristic pseudo-paralysis in a congenital syphilitic with other signs and history of syphilis

The syphilitic affection is distinguished from **rickets** by its early onset, from about the third week (in contrast with the third month in rickets) the absence of sweating about the head and the presence of other signs of syphilis

From **infantile paralysis** and **scurvy** it is distinguished by the early age at which it occurs, and from infantile paralysis also by the local tenderness and the contraction of the muscles when the skin is irritated The localisation of the thickening and tenderness to the epiphyseal line contrasts with the diffuse thickening along the shaft of the bone which occurs in scurvy

Chronic periostitis of the long bones usually occurs between the ages of eight and fourteen, and affects a number of bones often symmetrically In the tibia, which is probably more often affected than any other bone it produces a characteristic deformity which has already been mentioned (see p 100) The middle third of the diaphysis is chiefly affected and the eventual result is lengthening and thickening of the whole bone, with curvature forwards of its anterior margin, producing the " sabre tibia " which is a valuable sign of congenital syphilis in later life Occasionally the swelling softens and breaks by a sinus through the skin Gummatous bones sometimes occur also on the long bones.

Syphilitic dactylitis is generally an earlier affection than that which has just been considered occurring before the

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of the underlying bone. The diagnosis is effected by the history and the presence of other signs of syphilis.

Pronounced anæmia and marasmus are so frequently the result of congenital syphilis that a wizened, café-au-lait-coloured baby should, apart from other things, suggest a search for a syphilitic foundation though it does not follow from this that a well-nourished infant is not syphilitic. Delayed development is often a consequence of syphilis, and an enquiry in this direction in all such cases may give the required hint as to treatment.

The connection between congenital syphilis and the affections of the nervous system found in childhood has latterly been shown to be closer than was generally thought. Many authorities have long held that congenital syphilis has a great deal to do with a number of the nervous affections found in childhood and young adult life but the difficulty of proof lay in the very vague histories which were available and the absence of signs of syphilis on the bodies of many of the patients. Lately by means of the Wassermann test, it has been shown that an important proportion of these cases are syphilitic, far more in fact than show stigmata or give a clear history of syphilis. Beyond this it would be out of place to discuss the matter here, and it can be said only that idiocy hemiplegia with other paralyses (including those of individual cranial nerves), and hydrocephalus have very frequently been connected definitely with congenital syphilis. Gumma of the brain and meninges also occurs while juvenile tabes and general paralysis are of course, syphilitic in origin.

The Diagnosis of Congenital Syphilis is generally easy in an infant with a number of the signs mentioned above. The points of chief importance are the mother's history of miscarriages etc.; the early appearance of the symptoms, within a few weeks of birth the wasting, with wrinkled, café-au-lait-coloured atrophic skin generally; snuffles and hoarse cry; the occurrence of lesions on the

end of the second year Usually the proximal phalanges of two or more digits are affected and fingers suffer more often than toes The affected phalanx becomes fusiform, and if untreated the swelling may break down to discharge through a sinus As mentioned (p 117), it may also occur in adults as a result of acquired or of congenital syphilis

Syphilis of the flat bones has been partly dealt with in connection with the nose and palate Sometimes there may be definite necrosis of the skull with possible exposure of the dura mater and the process may be multiple Swellings on the front of the sternum have also been recorded as due to congenital syphilis All these are usually found within the first year

Parrot's nodes, in which bosses appear on the frontal and parietal bones around the anterior fontanelle producing an appearance like a hot-cross bun and craniotabes in which the skull shows unusual thinning in places, are believed by Still and other authorities to be as often due to rickets as to syphilis so that they have little diagnostic significance

The **joints** are not very often affected Three forms are described in congenital syphilis The first in which suppuration results from epiphysitis has already been mentioned The other two occur from five to eighteen years of age **Chronic synovitis** with effusion generally into symmetrical joints and more commonly the knees than others is characterised by its insidious onset and development and the slightness of pain which allows the joint to be moved freely The diagnosis from tubercular disease is made easy by its association with other signs of syphilis and the comparative freedom from pain **Osteo-arthritis,** with definite lipping and osteophytic formation also occurs and may affect the fingers There is some limitation of movement, simulating rheumatoid arthritis and some of these cases are associated with definite fibrillation and serpiginous ulceration of cartilage with destruction

mouth and throat, eyes nose, face, ears tibiae, and testicle For convenience, these may shortly be reviewed

Teeth.—Notching of the two permanent upper central incisors (fig 35), which have a narrower cutting edge than base (Hutchinson's teeth). Dome-shaped first permanent molars (Moon's teeth) It would be wrong to found a diagnosis on any other dental malformations than these, though they might be due to syphilis

Tibiae—Thickened from before backwards with curvature forwards of crests.

Face.—Radiating scars on the lips (fig 44).

Eyes.—Opacities of the cornea, the remains of keratitis; synechiae from past iritis and choroiditis

Nose saddle-shaped (fig 28) or bull-dog-shaped

Palate perforations

Throat.—White scars occupying the fauces, soft palate and posterior pharyngeal wall.

Ears.—Deafness, which is absolute for bone conduction

Testicle shrunken and nodular and with no testicular feeling

The Wassermann reaction may be of great assistance but it must be remembered that it tends to die out after puberty and a negative reaction correspondingly loses any value it may have in younger subjects.

It should also be remembered that there is no time limit to the onset of tertiary affections in congenital syphilis.

palms and soles as well as the presence of the spirochæta pallida in the skin and mucous membrane lesions and the positive Wassermann reaction **Ordinary pemphigus neonatorum** does not occur on the palms, nor is it associated with other lesions The infant remains well nourished, and spirochæta pallida cannot be found in the serum from the bullæ.

Probably most mistakes are made over rashes about the buttocks such as ordinary erythema impetigo and perhaps vacciniform dermatitis

Ordinary erythemata are brighter red found mostly on parts which are rubbed by wet clothes and napkins and not on the face or the palms and soles

Impetigo and seborrhœa affect the flexures and somewhat similar regions to those favoured by syphilis They are not associated with snuffles the palms and soles are not affected the colour is a brighter red and the nutrition is not so profoundly affected

Vacciniform dermatitis occurs as vesicles and sharply circumscribed excoriations or ulcers varying in size from a quarter to half an inch chiefly about the genitals and perineum It is not associated with macules papules, snuffles or other signs of syphilis.

The diagnosis of the syphilitic lesions which may occur in late childhood in adolescence and in adult life was given when these were considered and it remains only to say that, when an obscure lesion cannot be clearly explained by some other cause it is always well to make enquiries and tests which will clear up the question of syphilis as an ætiological factor This applies especially to bone and joint affections of childhood and adolescence defects in development and intelligence obscure nervous complaints and affections of the lungs, liver and kidneys In making these enquiries the stigmata of earlier hereditary syphilis which may be found on the body are of great assistance, besides the mother's child bearing history The stigmata for which one would look more particularly are in the teeth,

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thumb or lobe of one ear or by veni-puncture, the latter being by far the simpler and quicker In the majority of cases when the blood is obtained by simple prick of the skin it takes much longer to collect the necessary quantity and the patient suffers really more pain in the end than when a hollow needle is run into a vein and the blood allowed to flow into a test-tube. The latter method has the advantage, too that it is excellent training for the administration of remedies by the intravenous method Veni-puncture may however be impracticable and both methods will be described

The requisites for the collection of blood from a finger etc., are a small flame, a piece of bandage to congest the finger a pricker and a receptacle for the blood The flame may be improvised by soaking a small piece of cotton wool in spirit and lighting it, or an ordinary match will serve The pricker may be an ordinary surgical needle, preferably a Hagedon, or a sharp-pointed piece of glass made thus: Take a piece of glass capillary tubing and, holding it by both ends, melt its middle portion in the flame then pull out the middle portion into a fine strand and break off, leaving two very finely pointed stems of glass These are broken down, by striking one against the other until a point of sufficient sharpness and yet strength is obtained on one of the halves This is the simplest method of making a pricker there is always some capillary tubing in the equipment used for the taking of blood and if the pricker is made on the spot there is one less instrument to look after The receptacle for the blood may be either a capsule such as is ordinarily used for collecting specimens for the Widal and similar tests, or a small test-tube such as one in which samples of tabloids are often sent. If the latter is used it must be clean and quite dry and it is necessary to have also an arrangement like a fountain pen filler to transfer the blood from the finger to the tube.

The following are the steps in the filling of a Wright's

CHAPTER XVI

THE TAKING OF SPECIMENS FOR LABORATORY EXAMINATION —THE EXAMINATION OF SPECIMENS BY THE DARK GROUND AND OTHER MICROSCOPICAL METHODS

THE routine laboratory examination of specimens from cases of venereal disease comprises the following (1) The Wassermann test of the blood serum and of the cerebro-spinal fluid (2) The enumeration and microscopical examination of cells in the cerebro-spinal fluid and the chemical examination of the latter for the presence of excessive globulin (3) The microscopical examination of material from venereal lesions

Although in point of time the microscopical examinations should come first, it will be more convenient to deal first with the specimens which are obtained for the Wassermann test, since it is proposed to describe here only the technique of obtaining the necessary material for examination

THE TAKING OF SPECIMENS FOR THE WASSERMANN TEST

Blood serum may be obtained either by the application of a blister or more usually by drawing off a quantity of blood The minimum amount required by the pathologist varies greatly with his technique, but the safest plan is to send not less than 1 c.c of serum. This has the advantage that in any case the preliminary manipulations which are carried out in the laboratory are much easier than when a smaller quantity of serum is supplied and the amount is sufficient for any form of test which the pathologist may practise The blood can be obtained by pricking a finger

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an insignificant amount of blood that the patient has to be pricked again. The very end of the curved arm of the capsule is applied to the drop of blood, which runs into the barrel of the capsule Whilst it is filling, care should be taken not to let any of the blood run into the straight arm, since this causes difficulties over the final sealing The capsule should be about two-thirds filled and must then be sealed as follows The straight arm is warmed in the flame from beyond the blood to the end (so as to expand the air and drive some of it out), and is then sealed by holding its tip in the flame. To avoid overheating the blood during this operation it is best to hold the capsule so that a finger and thumb are always interposed between the flame and the blood When the straight arm has been sealed this end of the capsule begins to cool down the air in it contracts and in doing so naturally drags out of the curved arm the blood which fills this portion of the capsule No attempt should ever be made to seal the capsule at a part which contains any blood or serum since this results only in the formation of a plug of charcoal there, which allows the fluid contents of the capsule to leak out into the packing The curved arm is apt to break in the post, and it is better to seal it fairly close to the barrel of the capsule. The simplest plan of doing this is to take the capsule between index finger and thumb holding it by the curved arm where the latter leaves the barrel, and with the straight already sealed arm upright. Then by bringing the hand which is holding the capsule smartly down to the side, the contents of the capsule are thrown into the straight arm, leaving the curved arm empty It is then quite easy to seal the curved arm close to the barrel by holding it to the flame at the selected point

When a simple test-tube and pen-filler are used there are no technical details which require special description The blood is simply drawn into the pen filler and transferred to the tube (fig 40). It is useful to have a small

capsule (fig 45) It will be remembered that it consists of a stout tube-like body which is drawn out to a straight capillary arm at one end and to a curved one at the other The end of each arm is first broken off after perhaps making a pricker from a portion of the straight arm.

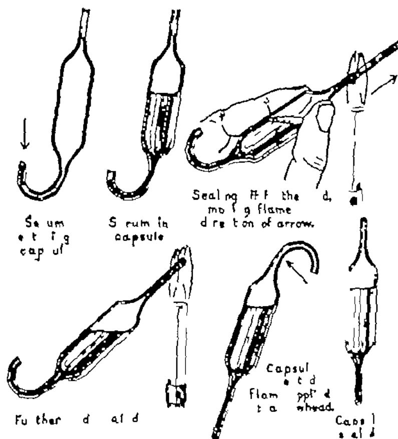


Fig 45. Steps in the filling of a Wright s capsule with blood or serum.

The patient is made to shake his hand as if to rattle the fingers together and a piece of bandage is wrapped round the selected finger from the base nearly to the nail so as to congest the distal portion which is then boldly pricked a millimetre or so behind the nail. Much annoy ance, and eventually more pain to the patient results from timid pricking which hurts just as much and yields such

useful addition which makes quite sure of preventing this accident is the following (fig 47), which I learnt from a former worker (Captain H. Browning) in the Guy's Hospital Bacteriological Laboratory The test tube is fitted with a perforated cork, into the side of which a V-shaped notch is cut to act as a vent. Through the cork is pushed a piece of glass tubing, so as to project about half an inch into the test-tube and the same distance outside it. To the outer end of the glass tubing is fitted a short length, say 3 inches, of ¼-inch rubber tubing and at the end of this a metal connection for the needle. The glass tubing as well as the rubber are such as were once commonly used in babies feeding-bottles

The operation of veni-puncture is carried out as follows:

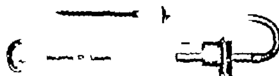


FIG. 47.

(1) Fasten the piece of rubber tubing round the upper arm and make the patient clench his fist so as to congest the veins at the bend of the elbow (2) Paint the skin over a prominent vein with tincture of iodine. (3) Grasp the forearm of the patient in such a manner as to fix the skin with the left thumb, but keeping the latter well below the site of the puncture, so that it will not interfere with the manipulation of the needle If the skin is not steadied in this manner it will move before the point of the needle and by the time the needle has perforated the skin it will be anywhere but over the vein. I mention this particularly as nine out of ten operators at the first attempt either fail to steady the skin or try to do so from above the site of the puncture. (4) Holding the needle by its base practically parallel with the vein, pointing in the direction of its flow and with the eye of the needle looking upwards, push the

piece of plasticine in which to stick either a capsule or a test tube during this operation In the absence of plasticine, bread-dough would answer

The requisites for taking blood from a vein are as follows (1) A fairly stout hollow needle, such as is supplied with a 10 c c syringe (or an intramuscular needle would serve). This is most conveniently sterilised by keeping it immersed

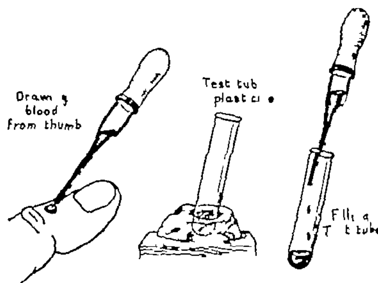


FIG. 46 Filling of a small test-tube with blood from a finger prick.

in alcohol and burning off the alcohol before use Its patency should be assured before use by holding it in forceps with the base upwards and watching the alcohol flow from the base through the needle and out at the point. Also it is well to look at the point to see that it is not turned With skilled workers failure to obtain blood is almost always due either to blockage of the needle or to turning of the point (2) A test tube (3) A piece of rubber tubing to congest the veins of the forearm. (4) Some tincture of iodine. (5) A piece of lint and a small piece of sticking plaster

With these articles alone it is easy to take a specimen of blood without risk of spilling any on the carpet but a

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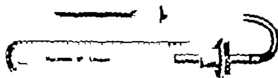


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point of the needle *steadily* through the skin The chisel like shape of the needle-point can be trusted to carry it deeper into the vein It is not necessary to plunge the needle at a *great angle* through the skin as is sometimes done the result of plunging the needle in this manner is usually to run it through the other side of the vein The needle should be pushed through the skin deliberately not with a jab since the latter method also results in transfixing the vein and no blood flows Successful puncture is shown of course by blood appearing at the end of the needle or at the end of the glass tube inside the test tube, if the Guy s Hospital device is used If no blood flows and the needle is well into the tissues the best plan is to pull gently outwards watching for the flow of blood into the test tube This generally succeeds since failure to obtain blood is usually due to the needle having been pushed right through the vein It is rarely necessary to pull the needle completely out, even if the blood does not flow by the time the point has almost emerged It is better to take stock of the relative positions of needle-point and vein once more and try again through the same puncture as patients are apt to count the number of skin punctures they have suffered Perhaps some apology is needed for spending so many words over such a trivial operation as vein-puncture but it is irritating to fail and I have tried to insure the reader s success at the first attempt by mentioning the pitfalls which have occasioned all the failures I have seen

When about half a test tubeful of blood has been drawn first tell the patient to unclench his fist then release the *tourniquet* and only then remove the needle. As the needle is removed place a pad of lint over the puncture and tell the patient to hold it there while his punctured arm is held up in the air Put down the sample of blood and seal the puncture with a small piece of sticking-plaster or by bandaging on a pad of lint, or with collodion The details regarding the steps for the removal of the needle are to avoid a small hæmatoma which might

otherwise form under the puncture and cause the patient some discomfort. The blood can be sent as it is with a cork in the test-tube but since serum does not travel very well in contact with the clot, often arriving heavily tinged with hæmoglobin, it is better to draw off the serum and send only this The blood is set on one side until the serum has separated as it does in a few hours The serum is poured off into a watch-glass or a spoon, and then pipetted off, or run into a Wright's capsule just as if it were blood being collected from a finger

Collection of Cerebro-spinal Fluid.—The apparatus required for lumbar puncture is as follows (1) A needle supplied for the purpose such as Barker's, one supplied



Fig 48. White's modification of Jeanselme's needle.

with an outfit for the administration of anti-meningococcic serum or Major C F White's modification of Jeanselme's (fig 48), which is much finer than the others. I prefer a steel, 8-inch needle of 60 gauge. If introduced without a stilette, fluid commences to drop from the base as soon as the point has entered the spinal canal, and there is no fear of pushing it in too far (2) A pair of clean test-tubes. (3) Apparatus for the production of local anæsthesia. The patient should rest in bed the whole of the day of the puncture, particularly after it, since he may otherwise suffer from troublesome or even serious meningeal symptoms—severe headache, pains in the back, and even collapse. Given these precautions, one need have no apprehensions regarding the results of lumbar puncture. I have seen very many carried out without ever having had any subsequent cause for anxiety

The operation is carried out as follows The patient is made either to sit on a narrow table or stool, or to lie on one side In either case he is encouraged to arch the lower part of his back as much as possible The site for the puncture is between the third and fourth lumbar vertebræ and is just below a line which is level with the highest points of the iliac crests The gap between the vertebræ is defined at this point, and the skin over it sterilised with iodine A local anæsthetic is not absolutely necessary but is recommended since it deprives the operation of any unpleasantness The following method is practised with great success from this point of view by Mr C H. Mills At the site of the proposed puncture, a wheal about the size of a three-penny bit is produced by infiltrating the skin with 8 per cent. eucaine The needle is then pushed in perpendicularly to the skin leaving a chain of drops down to the ligaments which will be punctured each of which is infiltrated in turn After a few minutes the skin is nicked with the point of a bistoury and everything is ready The puncture may be made through the middle line or very slightly to one side of it, according to the taste of the operator If made slightly to one side the needle should not be inclined so that its direction is unduly transverse as may be done, but should be entered practically at right angles with the back. If the direction is wrong, the needle-point will quickly strike bone it should then be brought back somewhat so as to disengage and the direction slightly changed

Sometimes it seems impossible to avoid bone the needle-point at each attempt striking spine or lamina or the stem becoming tightly grasped by these structures In such cases the patient is generally not arching his back sufficiently he is apt to shrink inwards while the needle is being entered and to nip the needle It is less likely to happen when the finer Jeanselme's needle is being used and is also a good reason for the use of a local anæsthetic

When the direction is correct, the needle is felt to traverse rather tough tissue until it reaches a place where the resistance seems to be of an indiarubbery nature Pushing steadily on, if a needle without a stilette is being used, th dropping of fluid from its base indicates that the canal has been entered When a stilette is used an indescribable feeling tells one that the needle has entered a cavity and the stilette is withdrawn. If fluid does not flow though the direction has appeared to be correct, it may be that the needle is blocked and a stilette should be pushed through it. The greater probability is that the membranes have not been punctured but pushed before the needle. In this case it is well to withdraw slightly and push it in again this time with a slightly jabbing twisting movement but naturally taking care not to stab so violently as to carry the needle-point across the spinal canal, into the body of the vertebra. As a general rule, there is no hitch in the operation and when matters do not proceed in quite a straightforward manner they can usually be rectified by attention to the above points, working systematically patiently and without flurry

When the cerebro-spinal fluid begins to flow the first three or four cubic centimetres should be rejected as this portion may contain some blood. The amount which is drawn should be about 7 c.c., including the rejected portion.

Two of the tests to which cerebro-spinal fluid is subjected are so simple that they can be carried out by the practitioner himself One is the count of the cells and their microscopical examination and the other is the test for globulin

The enumeration of cells is carried out as follows Some 1 per cent. methylene- or thionin blue solution is filtered into a watch-glass The tube containing the cerebro-spinal fluid is inverted two or three times to insure an even diffusion of cells through it, and the dilution (or rather the staining) for counting purposes is then carried

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the field The latter will then contain very approximately fifty small squares. (3) Count the leucocytes in eighty such fields, renewing the specimen as required (4) Since the capacity of each square is 1/4,000 c.mm. and 4,000 squares have been counted, the total leucocytes seen multiplied by $\frac{10}{9}$ represents the number per c.mm. of fluid

The Fuchs and Rosenthal chamber as mentioned is much more convenient The total capacity of its ruled portion is 4 × 4 × 0·2 = 3·2 cubic millimetres The whole ruled area is counted and the total multiplied by $\frac{10}{9}$ and divided by 3·2 (or for practical purposes, the total divided by 3) gives the number of cells per cubic millimetre.

For microscopical examination a drop of the fluid is allowed to evaporate on a slide and stained by Leishman's or similar method (see Appendix II) The leucocytes seen in syphilitic fluid are mainly lymphocytes—cells with a single nucleus surrounded by very little protoplasm. In addition may occur a smaller number of large mononuclear cells in which there is more protoplasm round the nucleus

The test for globulin which is usually applied is known as the Nonne-Apelt test. Others, such as Noguchi's are also used for the same purpose but the Nonne-Apelt seems to be the simplest A cubic centimetre of a saturated solution of ammonium sulphate (made by adding an excess of ammonium sulphate crystals to water so that after heating a few crystals remain at the bottom) is placed in a small test-tube, and on the top of it is floated an equal quantity of the fluid Globulin is indicated by the formation of a turbid ring at the junction of the fluids within three minutes, and the mixture becomes turbid on shaking

Specimens for Microscopical Examination

Specimens which are taken from the lesions of venereal patients for microscopical examination are for the purpose of finding the gonococcus or other micro-organisms which

out This can be done either with a leucocyte-counting pipette such as is supplied with a Thoma Zeiss hæmocytometer or more simply with an ordinary capillary pipette In the former case a little of the fluid is poured into another watch-glass and used to dilute the stain The latter is drawn up to the 1 mark of the hæmocytometer pipette which is filled up to the "11 mark with fluid The mixture is completed by shaking the pipette and the fluid in the capillary portion of the tube is blown out The dilution of the fluid is then 9/10

A capillary pipette is really more convenient than the special one for leucocyte counts A mark is made with a grease pencil on the capillary portion of the pipette and with the help of a rubber teat attached to the barrel a volume of stain is drawn up to the mark. This is followed by a small bubble of air and then nine measures of fluid are drawn in succession up to the mark, separating each with a bubble of air The mixture of fluid and stain, thus drawn into the barrel of the pipette is then expelled into a clean watch glass and well mixed by drawing it in and out of the pipette. This method has the advantage that it is simple makes quite certain that the cells are evenly distributed through the mixture and that an undue proportion of them is not adhering to the pipette as may happen with the special pipette

Having made the mixture a small drop of it is transferred to the special counting chamber and the cover slip applied An ordinary Thoma Zeiss or similar hæmocytometer can be used but a more convenient chamber is a Fuchs and Rosenthal, which enables the cells in a larger quantity of fluid to be counted at one time When the Thoma Zeiss chamber is used, the following plan recommended by Emery saves much time (1) Place the counting chamber on the microscope stage and using a 1/6 objective bring the ruled area into focus. (2) Pull out the draw-tube of the microscope until it is seen that the width of eight small squares equals the diameter of

Urine threads are often examined microscopically and may be spread as follows: Transfer the thread to a slide by capturing it with a platinum loop or in a capillary pipette. Dry off all the excess of moisture with blotting paper and then spread the film with the platinum loop or the end of another slide. In this case some scrubbing movement of the loop or the other slide, over the surface is usually necessary. The spreading of the film is assisted by holding the slide high above a flame, in order to warm it gently.

Other films for ordinary microscopical examination are spread in the same manner as that mentioned first above. The great point in preparing a film for microscopical examination is to make it as thin as possible. The tendency is to plaster a thick layer over the slide, and the result is that only a very small section of it, if any, shows discrete cells, and it stains unevenly.

If the practitioner does not wish to examine the film himself, a simpler method is to allow some of the pus to flow by capillary attraction into a glass capillary tube, shake down to the centre of the tube and seal off both ends in a small flame. This enables the pathologist to spread the film as he likes it best and shifts the responsibility for its quality. The method is similar to that which was once commonly employed in taking lymph from vaccination pustules. Gonorrhoeal pus is often so thick, however, that it will not flow unassisted into such a capillary tube and in this case a good plan is to employ a capillary pipette with a rubber teat (see fig. 40). The capillary pipette is similar to a fountain pen filler except that the narrow portion is drawn out into a finer tube. The pus should be drawn only into the capillary portion of the pipette and before releasing the teat the end of the pipette is sealed off in the flame. The rubber teat is then removed, and the capillary portion of the pipette cut across with a flame at a point between the barrel and the specimen. The operation demands a little skill in the manipulation of the

may be concerned in urethritis Ducrey's bacillus or other micro-organisms which may be concerned in soft chancre or the spirochæta pallida. Of these the first *and last are by far the most important*

In all cases except where the spirochæta pallida is sought, the only method which is available is by examining a stained film of the secretion in question The spirochæta pallida can also be found by staining and ordinary microscopical examination but the most practical method is by dark-ground illumination

In **cases of urethritis** the material must always be obtained from the meatus *not from the mouth of the prepuce* Clean the mouth of the meatus with spirit allow this to dry and squeeze the secretion from the depths of the urethra Take up a drop of it from the meatus with a platinum loop or with the end of a microscope slide and deposit it on a microscope slide close to one end and mid way between the long edges Take another slide which may be called the spreader and apply one end of it to the drop so that the latter flows between the end of the spreader slide and the face of that on which the drop has been deposited Since gonorrhœal pus does not flow easily it may be assisted to do so along the line of contact between the face of one and end of the other slide by moving the spreader from side to side two or three times across the face of the other Then incline the spreader to the other slide (which may conveniently be laid flat on a table) so as to make an angle of about forty five degrees with it and keeping it in contact with the specimen either push or drag it along the face of the spread slide from one end to the other carrying with it the line of pus, which is thus transformed into a thin film. The method is of course that which is usually employed for the spreading of blood films It is a much better one than scrubbing the drop of pus about the surface of the slide with a platinum loop, since the latter method must break up cells and in any case results in a thick uneven film.

found covering the epithelial cells, which then predominate in the specimen

Epithelial cells are best recognised by their flat appearance, polygonal or triangular outline, single nucleus about the centre of the cell, and the small size of the nucleus in comparison with the rest of the cell. These cells often also predominate in old cases of gonorrhœa, and in cases of urethritis which are due to other causes than the gonococcus. The number of gonococci within a single pus-cell varies very greatly In an average film there may be whole



Fig. 43. Gonorrhœal pus, showing one pus-cell packed with gonococci. (Muir and Ritchie.)

fields of cells without a single gonococcus in one of them then a field with one cell out of the whole number containing a single pair or perhaps two or three and, lastly after searching half a dozen or more fields, one is found in which a few of the cells contain the gonococci in the typical text-book manner the appearance then being as if the pus-cell had been well peppered with shot. Sometimes, too, certain pus-cells are densely packed with gonococci.

Gonococci are also found extra-cellularly but it is well to be very cautious about extra-cellular diplococci, even though they may look like two opposed coffee beans and be Gram-negative. In specimens from patients suffering from

tent, which can easily be attained by preliminary practice with water

Staining of Microscopical Specimens.—The technique of the commoner methods of staining for gonococci and other micro-organisms concerned in venereal diseases will be found in Appendix II.

Regarding these, many stains have been brought out from time to time which claim to be diagnostic of gonococci. Some certainly produce quite pretty specimens but none of them has proved satisfactory from the diagnostic point of view For routine examination of films of urethral secretion I have found the most useful plan is to stain one specimen by Gram s method and the other by some simpler method such as methylene- or thionin blue The Gram staining is essential since it serves to separate the Gram positive from the Gram-negative diplococci, and the former might lead to confusion owing to the likeness of some of them to the gonococcus The simple blue stain is a useful check on the Gram stain since it shows up all the organisms perhaps a little better and it might happen occasionally in the Gram specimen that the counter-stain did not work well

The chief micro-organisms found in urethral secretion may be divided into gonococci and others The gonococcus occurs most typically as a diplococcus the two elements of which are shaped like a kidney or a coffee bean and arranged with their concave or flat sides opposing one another (fig 49) The size varies somewhat in different specimens but the average is about 1 μ *Gonococci* are Gram negative, being stained red by the counter-stain mentioned in Appendix II They take the counter-stain more intensely than the nucleus of the cell and stand out clearly defined against the background like so many small shot *In acute cases the gonococci are* found typically within the polymorphonuclear leucocytes or pus cells which will be found throughout the specimen In an earlier stage, which is not often seen they may however be

it is always valuable to examine urethral secretion or threads microscopically Although acute urethritis is due to the gonococcus in the very great majority of cases, it occasionally happens that another micro-organism is the cause. If the pus i examined in acute cases before any treatment is applied the absence of gonococci with the



FIG 51 Secretion from an old case of urethritis, showing two types of bacilli A and B both intracellular (Micro-photograph by Captain T Thomson R A M C)

p s e f other icro-organisms in large numbers will j st f a diag osi f non gonococcal urethrit which might be ery n portant t the patient. Again, during the treat n nt f a se f g norrhoea a n icroscopical examination n a reveal the fact f a mix l infection having supervened wh h w uld indicate a change of treatment. In old-stand ng ases f gonorrhoea, while one may find either in threads r the scanty secret on expressed from the urethra, pus cell in large numbers containing typical intracellular

urethritis of long standing it is a common event to find a mixed infection and amongst the other micro-organisms there are often some which simulate the gonococcus rather closely Perhaps the commonest of these is a short, stout, round-ended bacillus which though Gram positive in well-stained specimens, may lose the purple and take the counter-stain, like the gonococcus, if the specimen has been stained rather carelessly and often divides into two elements which are so short that they appear very like a pair of gonococci. The diagnosis is made by finding in the specimen others which are obviously bacilli but also obviously of the same nature as the would be deceivers. Sometimes staphylococci appear rather like gonococci, having failed to retain the Gram stain. As a rule, however in these cases the two elements of the diplococcus are definitely round not flattened on one side. They are rather bigger than gonococci and throughout the specimen one will find numbers of other staphylococci arranged in the bunch-of-grapes formation affected by these micro-organisms. Figs 50–52 illustrate two distinct varieties of bacilli found in one specimen of urethral secretion from an old case of gonorrhœa. Although both are unlike the gonococcus being bacilli and not cocci, and being also Gram-positive, they illustrate the necessity for care in the examination of even intra cellular bacteria. The examples mentioned by no means exhaust the list of bacteria to be found in the secretion from mixed infections.

It will be gathered from the above that the gonococcus can be diagnosed with tolerable certainty only when it occurs as a Gram negative diplococcus of typical shape and typically distributed within pus-cells, and this appearance is most likely in the acute stages, where the signs, such as acute purulent urethral discharge, etc. point strongly to a diagnosis of gonorrhœa. One may wonder therefore, what is the use of a microscopical examination to the diagnosis of gonorrhœa. In spite of its limitations,

are of no particular importance. Lastly not to labour the point unduly the microscopical examination is useful in those cases where the patient has been injecting a prophylactic which is too strong His history usually is that he



FIG. 3. Micro photograph (by Captain D. Thomson) of the diphtheroid bacilli shown at B in fig. [illegible]

had [illegible] the connection and fearing the consequences, [illegible] strong antiseptic Then appeared a little feeling of irritation at the meatus, which confirmed his worst fears, and more antiseptic was injected still apparently without effect in arresting the dreaded complaint, since the discharge gradually became more profuse and

gonococci, one may sometimes find on the other hand, that a patient has been worrying over threads in his urine which prove to be nothing more than mucus, or plugs of prostatic secretion containing no pus-cells whatever Again,

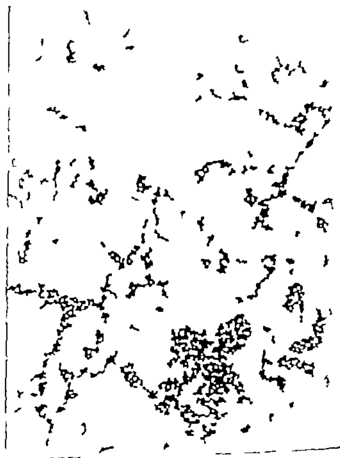


FIG 51. Micro-photograph (by Captain D Thomson, R.A.M.C.) of a stained film of a culture of the short bacilli shown as A in fig. 50.

the microscope helps in certain cases where there has never been anything more serious than a stickiness about the meatus which is causing the patient much anxiety In these cases the scanty secretion which is scraped up from the fossa navicularis may show multitudes of organisms of all kinds, such as are found in balanitic secretion and

The examination of the pus from a suppurating bubo may be useful especially when the bubo appears angry and inflamed, and the patient is experiencing much pain. It may then be found to contain streptococci in large numbers. These are Gram-positive cocci, which grow in chains of varying length (fig 54). When they are present I have always found the greatest benefit from the administration of an autogenous vaccine.

The Spirochaeta pallida is commonly sought for in the following lesions venereal sores and others that simulate primary chancres enlarged indurated glands adjoining



Fig 54. Streptococci in pus (Muir and Ritchie.)

primary sores secondary syphilitic lesions, such as papules, condylomata and pustules such mucous membrane lesions as mucous patches in the mouth and on the pillars of the fauces and in nasal, aural, and rectal discharges. It is not so much sought in roseolar spots, although when these occur on the glans penis it is particularly easy to find the spirochete in them. Nor is it of any practical use searching for them in later syphilides. They can be found in these with patience, but the search must be carried out for such a long time that, for ordinary diagnostic work it is hardly worth while.

For microscopical examination it is necessary to obtain

eventually purulent. The obvious step in such cases is to stop the injection and the microscope is practically the only certain method of revealing the true state of affairs

Prostatic secretion usually contains spermatozoa, which are easily recognised and certain small round bodies which may be taken by the uninitiated for large swollen gonococci. They are much bigger vary in size, and are wholly round not shaped like gonococci. The point of importance in prostatic secretion is the presence or not of pus cells and of micro-organisms

The **secretion from soft chancres** is not often examined



FIG. 53. Ducrey's bacilli in pus. (Muir and Ritchie)

microscopically for diagnostic purposes The classical micro-organism which is stated to be found here is Ducrey's bacillus (fig 53) Generally it is not found and instead the pus is found to contain large numbers of Gram positive cocci and fine, often clubbed bacilli similar to those shown in fig 52 which are also Gram positive

Ducrey's bacillus must be sought for in the depths of the ulcer or in its wall, rather than in the free secretion. It is a small bacillus about $2 \times 0.5\ \mu$ or about twice as long and half as thick as the diameter of staphylococcus or a gonococcus. Its ends are slightly rounded and it is often found in chains of five to twenty bacilli. It is Gram negative.

needle is in a plane which is almost parallel with that of the groin. The fact that the gland has been punctured successfully can be demonstrated by moving the needle to and fro, when the gland will be felt to move with it. If the syringe is fitted and suction applied at once the needle generally blocks, and the following plan of obviating this was introduced by Mr C. H. Mills. A few minims of sterile saline are injected into the gland substance through the needle, and the gland is then massaged. The saline creates for itself a space around the needle-point, and the massage forces spirochaetes into the saline. Suction is then applied by means of the syringe, and a little blood-stained fluid aspirated. This is dealt with as will be mentioned for all other specimens (p. 252).

Condylomata and moist papules need only be scraped, as indicated for primary sores.

The **ordinary papule** which is found on the dry areas of the skin should always be examined when the worker is training his eye to the appearance of the Spirochaeta pallida. In other situations there may be some doubt in the beginner's mind as to whether the micro-organisms seen are really those of syphilis. But if he has taken his specimen from a syphilitic skin papule, he need have no doubt about the identity of any spirochaetes he may see in the specimen, provided, of course, that the patient is not suffering from relapsing fever. The specimen is best obtained by scraping off the surface of the papule and then either squeezing or applying suction to it. The following is a convenient method of doing the latter. The mouth of an ordinary test tube is lightly smeared with vaseline, and the blind end of it is heated in a flame. The mouth of the test tube is then firmly applied to the skin, so as to circumscribe the papule, and, by blowing on the blind end of the tube to cool it, the papule is cupped.

Mucous patches and other lesions within the mouth may be easy or difficult, according to their situation. The aim should be to obtain a specimen which is as free from saliva

serum from beneath the surface of the selected lesion and to avoid as far as possible, contamination of the specimen with other spirochætes which in certain situations may abound on the surface. The following hints on the taking of specimens may be found useful.

A **primary sore** must first be cleansed with a swab of lint wrung out in saline or boiled water which is usually sufficient to remove the surface spirochætes. The serum is then made to ooze from the *margin* of the sore, *not from its ulcerated or eroded centre* and the best spot is in the red, surrounding areola. This may be simply rubbed with a swab of lint, so as to remove the surface epithelium or rubbed with a swab which has been dipped in spirit and then wrung out nearly dry or scraped in the following manner which is preferred by the writer With the edge of a scarifier vaccination lancet, or scalpel, the surface is scraped so as to remove the superficial epithelium The aim is to induce serum rather than blood to ooze, although a little blood always does make its appearance. It is not necessary to dig into the sore with the point of the instrument, unless the patient has previously been applying antiseptics to it, and it is unlikely that the spirochætes will be found near the surface. In this case it is well to examine the groin first, and if there is an enlarged indolent gland there, a better specimen can be obtained from it, with less pain to the patient. If serum does not ooze freely after the sore has been scraped it should be squeezed out. If blood appears too freely the best plan is to wait for a few minutes until it has clotted, and the serum can then be taken off

From an **enlarged gland** the specimen is obtained with a hollow needle by puncture, followed by suction with a hypodermic syringe. The gland is pushed up against the skin and fixed there with the fingers of the other hand A moderately stout, hollow needle (such as is used for intramuscular injections) is then run into the middle of the gland from one pole of it—i e the line of travel of the

that end. The warming, of course, expands the air driving some of it out of the tube, and on cooling again the contraction of the remaining air sucks the serum into the middle of the tube.

The following is a good method of expelling such a specimen from a capillary tube without risk of infection. Lay a piece of lint on the left forefinger and, steadying the tube on it with the left thumb, nick it close to the serum with a file, or better a glass-cutting knife. Remove that end with a pair of forceps, and then, taking the capillary tube in a pair of forceps, put the sealed end of it into a flame, whilst holding a slide under the open end. As the glass melts, more and more of the tube is pushed into the flame, and the serum is expelled on to the slide.

The *Spirochæta pallida* is usually detected by microscopical examination with dark ground illumination, and the main details of its morphology will be discussed there. In Appendix II, however, will be found the details of some staining and other methods for its examination in dry films.

Stained by Leishman's method it appears as a very fine spiral which in well-stained specimens is rose-red, contrasting in this with other spirochætes, which are blue. It retains its spirals in stained films wonderfully well, though it sometimes appears rather pulled out in the middle. If this method is chosen it is well to stain two specimens, one lightly and the other for the regulation time. The lightly stained specimen will show any other spirochætes there may be in the specimen, but not Spirochæta pallida. If no very fine ones are found in the lightly stained specimen, but these are present in the deeply stained, it is probable that, if also morphologically indistinguishable, they are Spirochæta pallida.

Silver-stained Spirochæta pallida are black or dark brown. They have the same characteristics with regard to size and number of coils per unit of length, but always appear rather thicker (Plate XVI).

Specimens treated by Burri's method, or the modifications

as possible since the saliva may contain a spirochæte (Treponema microdentium) which is difficult to distinguish from the Spirochæta pallida. In the fore part of the mouth it is easy to dry off the saliva and obtain the specimen after scraping the surface of the lesion but on the pillars of the fauces some ingenuity is necessary to keep the saliva away A fairly big swab on a stick which is used at the same time as a tongue depressor often works quite well, but a great deal depends on the patient, as will be understood The lesion is scraped with a scarifier and the specimen may then be collected with the help of a large platinum loop or

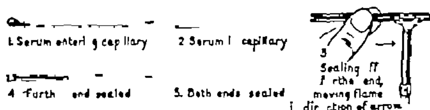


FIG. 55. Steps in the filling of a capillary tube with serum from suspected syphilitic lesion.

drawn into a capillary pipette as mentioned for gonorrhœal pus (p 241)

The disposal of the specimen depends on whether the practitioner intends to examine it himself or send it to a pathologist. The procedure in the former case will be dealt with under Microscopical Examination

When the specimen has to be sent to a pathologist the best plan is to allow it to run into a capillary tube (fig 55). The serum will run easily into the tube without suction and an amount which will fill half an inch of an ordinary capillary tube is sufficient for the microscopical examination. Care must, of course, be taken not to over heat the specimen in sealing each end of the capillary tube. If the serum cannot easily be shaken away from the end of the tube at which it entered hold the capillary tube between a finger and thumb so as to cover the specimen and then run the empty end once or twice through the flame before sealing off

PLATE XVI.



Spirochaeta pallida in lung of syphilitic foetus.

with collargol and congo red show the spirochæte unstained, against a background which varies in colour according to the method employed.

All these dried film methods have the great disadvantage that they fail to demonstrate the movements of the Spirochæta pallida which are of the greatest diagnostic value. More time is consumed in preparing the specimen, and as a rule, it is necessary to search it more thoroughly before a spirochæta pallida is found.

Dark-ground Illumination

The apparatus required for dark-ground illumination consists of an ordinary bacteriological microscope with two accessories which are brought into use when required The first of these is a special type of reflecting condenser which is fitted into the place usually occupied by the Abbe condenser The second is a diaphragm, or stop which is fitted to the back lens of the oil immersion objective when this is used for dark ground work Sometimes a special condenser is made to fit on the stage of the microscope and may then be used with or without the ordinary substage condenser according to the pattern of reflecting condenser selected

Since a rough idea of the mechanism of the dark-ground condenser assists in the understanding of the technique of working it, the following short account may be useful.

For practical purposes dark ground condensers may be divided into two main patterns hemispherical and paraboloidal. The former are represented by the Leitz, Baker and Swift, and the latter by the Zeiss Reichert, Watson, and Spencer Lens Company s condensers.

The mechanism of both will be understood from a study of the accompanying figures In fig 56 which represents the path of rays in a hemispherical condenser it will be seen that the cylinder of rays which rises from the mirror is reflected from a central hemispherical surface to a

peripheral, and thence upwards to the specimen, taking a path which is shown in fig 57 In a paraboloidal condenser the centre of the cylinder of rays from the mirror

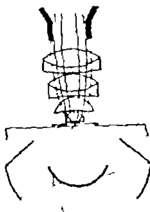


Fig. 56. Path of rays through Leitz dark-ground condenser to their focus on the upper surface of the slide, and thence through the objective.

is cancelled out by a stop and only the periphery of the cylinder reflected. The practical effect of this difference



Fig 57 Photograph of rays of light leaving hemispherical condenser. The bases of the two lower cones are at the top surface of the condenser; their meeting-point is the position of the specimen; the two upper cones represent the rays which have passed through the fluid part of the specimen.

between the two mechanisms is this that while the hemispherical condenser can work with a very narrow cylinder of light reflected from the mirror the paraboloidal requires

peripheral, and thence upwards to the specimen, taking a path which is shown in fig 57 In a paraboloidal condenser the centre of the cylinder of rays from the mirror

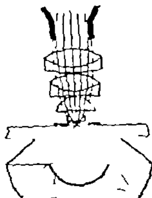


FIG. 56. Path of rays through a Leitz dark-ground condenser to their focus on the upper surface of the slide, and thence through the objective.

is cancelled out by a stop and only the periphery of the cylinder reflected The practical effect of this difference



FIG. 57 Photograph of rays of light leaving hemispherical condenser. The bases of the two lower cones are at the top surface of the condenser; their meeting-point is the position of the specimen; the two upper cones represent the rays which have passed through the fluid part of the specimen.

between the two mechanisms is this, that while the hemispherical condenser can work with a very narrow cylinder of light reflected from the mirror the paraboloidal requires

a broad one, as it can use only the periphery of it. Since the narrow cylinder can be made much more intense than the broad one and practically all of it is used by a hemispherical condenser and since the paraboloidal requires a broad cylinder of light, much of which it wastes, it follows that the hemispherical condenser can be worked with a source of light which is much weaker than that required for a paraboloidal, a matter of some practical importance.

Fig 57 is a photograph of the paths of rays leaving a hemispherical dark ground condenser and it will be seen that the rays come to a focus at a certain distance above the top of the condenser (the top of the condenser may be represented by a line joining the bases of the two lower cones) The paraboloidal condenser produces practically the same effect, but the point of intersection of the rays is smaller in the case of the hemispherical condenser than in that of the paraboloidal. The sharper focus point means greater concentration of light, which again makes for economy since the illumination of the specimen depends on the concentration of rays at this focus point. On the other hand to obtain good results with a hemispherical condenser the microscopical specimen must be placed exactly in the focus of the condenser not somewhere about there, though somewhere about there will give some sort of result with a paraboloidal condenser

The general principle of dark-ground illumination is this The rays of light leaving the condenser pass through a film of oil (distilled water will serve) to the microscope slide, which they traverse to the specimen lying on top of it. Here it is that the technique arranges that they shall come to a focus. The further course of each ray after reaching the specimen depends on what it traverses or strikes. A specimen which is prepared for dark ground examination consists of solid objects (blood-cells, bacteria, spirochætes etc.) and the liquid in which they float or swim about. The latter will constitute a background for the former Rays which traverse the fluid of the specimen

pass on practically without change of direction, much as is shown in the two upper cones in fig 57 They reach the cover-slip, and such is the angle at which they strike its upper surface that they escape the microscope, provided that the objective of the latter has a numerical aperture which is less than 1·0 The result is darkness, as far as the liquid part of the specimen is concerned, and this constitutes the dark background.

On the other hand, such rays as impinge on solid objects in the specimen are reflected from, or refracted by the latter and, taking a more vertical direction, enter the microscope, to form brightly illuminated images of those solid objects. This completes the picture of brightly illuminated objects, which are seen by virtue of their contrast with a dark background.

Certain conditions have to be fulfilled for the production of the above effects (1) The film of oil (or water) between the condenser and the slide must contain neither air bubbles nor too much dust. Otherwise the rays will be reflected upwards into the microscope regardless of what they meet in the specimen, and the dark-ground will not be produced. (2) The slide must be of such a thickness that the rays from the condenser can be brought to a focus on the top of it. If it is too thick they will come to a focus in the substance of the slide, and the specimen itself will be more or less in darkness (fig 58). (3) Steps must be taken to focus the rays on the top of the slide. (4) The focal point of the rays must be central with the rest of the microscope and (5) The aperture of the objective must be less than 1·0.

All types of objectives can be used for dark-ground work so long as they give the requisite magnification in combination with the eye-piece, and if a dry lens is used one can rely on the aperture being less than 1·0 without further care. It is generally found convenient, however to use an oil-immersion lens, and, since the aperture of most of these is 1·30 a stop has to be fitted to cut it down.



THICK SLIDE

FOCUS OF LIGHT INSIDE SLIDE



THIN SLIDE

FOCUS OF LIGHT BEYOND COVERSLIP

This can be adjusted by lowering the condenser



CORRECT SLIDE

FOCUS OF LIGHT IN SPECIMEN

FIG. 58. Illustrating the effects of using slides of different thicknesses.

This is conveniently arranged by the microscope maker who provides one which can readily be applied for dark ground work, or removed for examination of stained specimens.

Lastly the illumination has to be arranged and this must be artificial unless direct sunlight is available. The best radiants for the purpose are (1) Electric arc with carbon electrodes set at right angles, if the current is interrupted or Edison and Swan's "Pointolite" if it is continuous. (2) A lamp devised by Mr J E. Barnard

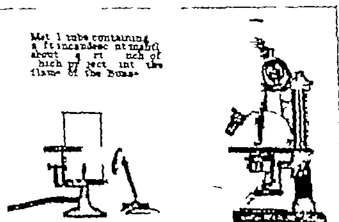


Fig 89. Lamp devised by Mr J E. Barnard, President, Royal Microscopical Society (Reproduced by kind permission of the Medical Research Committee)

and made by Angus & Co. Wigmore Street, for use with any form of gas. (3) Clarke's substage illuminator described below The last-named will not work with a paraboloidal condenser With the first two of the above-named a bull's-eye condenser (or a spherical flask filled with water) is necessary to condense the light on the mirror

Mr Barnard's lamp (fig 89) is admirable for use where electricity is not available. Its principle is that the end of a tightly rolled soft incandescent mantle is held







FIG 58 Illustrating the effects of using slides of different thicknesses.

This is conveniently arranged by the microscope maker who provides one which can readily be applied for dark ground work, or removed for examination of stained specimens.

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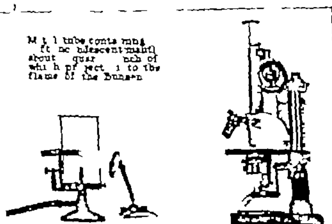


FIG. 80. Lamp devised by Mr J E. Barnard, President, Royal Microscopical Society (Reproduced by kind permission of the Medical Research Committee)

and made by Angus & Co., Wigmore Street for use with any form of gas. (3) Clarke's substage illuminator described below The last-named will not work with a paraboloidal condenser With the first two of the above-named a bull's-eye condenser (or a spherical flask filled with water) is necessary to condense the light on the mirror

Mr Barnard's lamp (fig. 80) is admirable for use where electricity is not available. Its principle is that the end of a tightly rolled soft incandescent mantle is held

in the hottest part of a Bunsen flame. The result is a bright disc of light which is ideal for dark-ground illumination It is hoped that the lamp will shortly be on sale. An acetylene lamp an ordinary inverted gas mantle, or even a paraffin lamp can be made to serve but require more skill and patience than the others mentioned, and

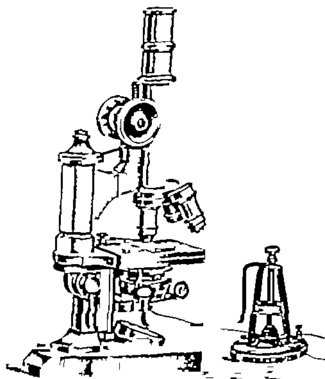


Fig 60 Clarke's substage lamp in position.

the objects are not illuminated brightly enough to suit the average worker It is probably for this reason that dark ground work has not hitherto been popular where electricity from the main was not available. To overcome this objection I have sought for some years for a lamp which could be used anywhere, concentrating rather on the idea of finding one which would shine directly through the condenser without the intervention of the mirror At my request, Mr N Clarke, of the Rochester Row Labor

atory has worked at the problem on these lines, and produced the lamp illustrated in fig 60 It is a flash light bulb mounted on an arm which can be raised and lowered by means of a milled head and connected up to a four-volt accumulator or a dry battery The lamp is set directly under the condenser and shows the *Spirochæta pallida* quite satisfactorily when used in combination with any hemispherical, but is not satisfactory at present with a paraboloidal condenser

Technique.—The following is the technique of mounting a specimen for dark-ground examination and obtaining the necessary illumination. The reader is strongly recommended to practise the steps detailed below whilst reading the directions.

(1) *To mount the specimen.*—Choose a slide of the thickness recommended by the maker of the dark-ground condenser It may be rather thinner but should be no thicker The serum for examination may be gathered directly from the lesion by touching it with the edge of a cover slip, which is held in a pair of Cornet forceps, or taken from a capillary tube, as directed above (p. 253). If the amount of serum gathered in this manner is too small to fill the space between the slide and cover slip, or if it contains so much blood that it appears bright red, a drop of saline should be added, or better a mixture of equal parts saline and water The cover slip is lowered gently on the slide from its edge, so as to avoid bubbles, though a few of these are not of any great moment. The specimen is made as thin as possible by turning it over and pressing it, cover slip down, on a piece of folded blotting-paper The edge of the cover-slip may then be ringed with vaseline, if desired, to prevent currents.

When the slide is eventually mounted on the microscope stage it is necessary to have a film of oil (or distilled water) between its under-surface and the top of the condenser

(2) *To centre the condenser* —One of three procedures may be adopted. If the condenser has two rings ground

on its upper surface for the purpose direct a fairly strong light on the mirror and manipulate this so as to illuminate the condenser

Then look at the top of the condenser through the microscope, using a low objective such as a two-thirds, and a low eye-piece, such as a No 1 or 2 The rings will be seen somewhere in the field and, by means of the centring screws on the condenser (fig 61) must be worked into the centre of the field so that they are concentric with it (fig 62).

If there are no rings on top of the condenser the following simple plan serves admirably Before fitting the condenser

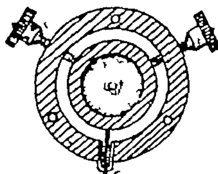


FIG 61 Diagram illustrating the centring mechanism on a dark-ground condenser

into its sleeve and before fitting an objective to the end of the microscope, direct a small light on the mirror Put on the lowest eye-piece, pull out the microscope tube as far as possible, and look down the microscope *from a distance of nine or ten inches above the eye piece* One then sees an image of the source of light in the diaphragm of the eye-piece. Manipulate the mirror until the light stands in the centre of the eye piece diaphragm Then screw on the lowest objective and fit the condenser *taking care not to disturb the mirror or the light* Mount the specimen on the stage with a film of oil intervening between the under-surface of the slide and the top of the condenser which should be flush with the top of the stage, and look at it through the low objective. A patch of light will be

seen somewhere in the field Work this patch of light into the centre of the field by means of the centring screws just as was done with the rings in the previously described method. The important thing to remember in all this is that neither light nor mirror must be moved after the

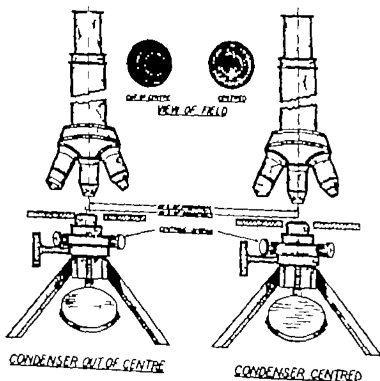


FIG 61.

light has been manipulated into the centre of the eye piece diaphragm.

The third method is to focus on a bubble in the specimen and manipulate the centring screws until it is evenly illu minated all round.

The centring may be perfected for the higher-power objective, when this is turned on, by the following plan

When the specimen is in the focus of the higher objective, rack down the condenser until a dark patch appears in the field If this patch is not in the centre of the field a very slight turn of the centring screws will bring it there and as far as centring is concerned the system is now in perfect order

(3) Arrange the light and bull s-eye so as to give the best illumination It is best to place all three so that the light is on a level with the mirror The bull s-eye is set in relation to the light so that it gives parallel rays, and the plane mirror is used The arrangement of light and bull s-eye is made easier if the room is darkened sufficiently to view the rays as they leave the bull s-eye. A piece of white paper held over the mirror acts as a good guide to the amount of light which is being thrown on it.

If a substage lamp is used it is simply pushed under the condenser and centred by looking at the patch of light it produces in the field of a low objective.

(4) *Focus the condenser*—This is easily done The specimen is viewed with a low power objective and a patch of light will be seen in the field If this is not in the centre, bring it there by manipulating the mirror Assuming that the condenser has been racked up so as to touch the slide, with only the film of oil intervening this patch of light may appear broad and diffuse, or small and very bright. In the former case it may even appear as a bright ring with a dark centre

Leaving the objective adjustments alone gently rack down the substage condenser whilst watching the patch of light. If it appears at first very broad and diffuse, or ring like, and becomes more so when the condenser is racked down, the slide is probably too thick. If it appears small and bright and on racking down, becomes bigger and more diffuse, the slide is probably of the right thickness If having been big etc. it becomes smaller and brighter the slide is thinner than the focus, but this can be corrected. The condenser is left in that position

at which *with the specimen in the focus of the low-power objective the patch of light in the centre of the field is at its smallest and brightest*. Poor results are often the consequence of failure to focus the condenser especially when this is of the hemispherical pattern.

The specimen is now ready for examination with the high-power objective. Naturally if this is an oil-immersion lens, a drop of oil is first put on the cover-slip. The objective is racked down until it is seen from the side to touch the cover-slip. Then the eye is applied to the eye-piece and the objective is racked upwards again using the coarse adjustment. If the field now appears quite bright, and the objects in it ill-defined and ghost like (*a*) the stop has not been fitted into the oil immersion lens in use, or (*b*) there is an air-bubble in the oil between the slide and condenser or (*c*) the cause lies in the use of very dusty oil. Air-bubbles are sometimes very irritating and the specimen has to be taken off the stage quite a number of times before getting rid of them. The use of distilled water in place of oil causes less trouble from the formation of bubbles, but the slide must be not much thinner than the focus of the condenser otherwise, when the latter is racked down in focussing the water will leave the slide.

After the specimen comes into view it may be necessary to make a few further adjustments to perfect the image. The latter may appear rather hazy and ill-defined, although the light is a strong one. This is generally because the focus of the condenser is still not quite in the specimen. A little further adjustment, racking the condenser up or down ever so little, will usually correct this.

The Diagnostic Features of the Spirochæta pallida under Dark-ground Illumination.—As observed under dark-ground illumination the Spirochæta pallida is a perfectly regular closely-twisted spiral, like a very fine spiral spring. Its coils are clean-cut and appear dead white, not dazzling like those of other spirochætes. This dead-white appearance is maintained even though the objective is racked

up ever so slightly above the focus, when most other spirochætes will display a tinge of rust The movements of Spirochæta pallida are generally typical: its progress across the field is very slow but it is very active in its own ground it twists on its long axis and alternately expands and closes its coils. In flexibility it has no equal amongst other spirochætes it may bend so that one half is at right angles or even an acute angle with the other or may curve its body into the shape of a complete circle, or may form a few of its coils into a small loop, whilst keeping the rest of its body rigid It is not possible actually to see the flagella but evidence of their presence is shown in the movements of particles which may happen to be just beyond the ends of the spirochæte. Length is not a characteristic of any value in diagnosis since the Spirochæta pallida may be as short as 4 μ or as long as 24 μ, the average being 8–10 μ. But the relation which the number of spirals bears to a given length is a useful aid to the diagnosis If a Spirochæta pallida and a neighbouring blood-cell be compared it will be seen that one can count seven coils of the spirochæte to the width of the blood cell.

Other spirochætes which may be found in specimens taken from the genitals are Sp refringens balanitidis, and gracilis The first is easily distinguished It is a very coarse spirochæte with very few spirals to a given length, and it travels across the field very quickly **Spirochæta balanitidis** is also easily distinguished It is a rather fat, little spirochæte, with two or three coils in its whole length, of about 5 μ and it travels so rapidly that one can often distinguish only a little wriggling object darting across the field On the other hand one may see specimens of balanitidis which are comparatively still they are easily distinguished however by their stumpy appearance and open coils, which contrast with the closely set, elegant coils of pallida.

Spirochæta gracilis is closely coiled and regular like

pallida, and it is more flexible than the two just mentioned so that it may be taken for pallida by the unwary. If they are compared side by side, it will be seen that gracilis is twice as thick as pallida. It is, moreover not so flexible, moves faster over the field, and a comparison of the number of its coils to the diameter of a red blood-cell shows that there are only about five in this length of spirochæte. With all this, it is still advisable when using a strange microscope, to take stock of the magnification employed, since under a lower magnification than usual gracilis may look very like pallida.

All the spirochætes mentioned have a more dazzling appearance than pallida, and they show the rusty tint mentioned above when the focus is adjusted slightly above the specimen. If the sore has been cleaned fairly well and the specimen is not contaminated with the balanitic secretion, one should see few if any of these spirochætes.

In specimens from the mouth may occur two spirochætes which resemble pallida more closely than any other save pertenuis (of Yaws), which is indistinguishable from it. Both are about the same thickness, or thinner and have perfectly regular coils. One is distinguished by its coils being much closer set the effect being to make the dark interspaces between successive coils considerably narrower and less clean-cut than in pallida (Plate XVII, fig 7; Plate XIX, fig 1). The other has the same clean-cut spirals but is rather finer and the coils are more angular (Plate XVII fig 8 Plate XIX, fig 2). It differs so little, however that considerable experience is necessary to detect the difference.

The reader is advised to gain his experience as much as possible from the examination of spirochætes obtained from syphilitic papules on the skin, which can only be pallida.

One other structure must be mentioned, which is sometimes seen in specimens under dark ground illumination, since although it should not cause confusion, it sometimes does. In specimens which contain much blood there are

often a variable number of very fine, pale, thread like bodies the exact nature of which is uncertain. They are often seen wriggling free across the field or numbers of them may be attached to the borders of cells, like streamers Sometimes they appear as simple filaments, at others as filaments joining together a number of brightly shining dots, and yet again, as a chain of minute circles, all three varieties often appearing in the same specimen. They have only to be examined closely to show that they are in no way spirochætes or in fact, micro-organisms, and mistakes can arise only from hasty examination.

CHAPTER XVII

THE INTERPRETATION OF LABORATORY REPORTS

LABORATORY reports are often misinterpreted in various ways. Sometimes the fault lies with the pathologist, who imagines that all clinicians are as fully conversant with the meaning of his hieroglyphics as his own immediate *entourage*. Often it is the clinician who cannot interpret the pathologist's findings sufficiently well to put them to their proper use in the formation of his decision. A common mistake is to imagine that it is the pathologist who is diagnosing the case, and to allow his report to override every other piece of evidence which may have been gathered. It is true that the laboratory evidence very often does decide the question correctly but it would be a mistake to think that it dispenses with clinical examination.

Perhaps this chapter may serve to bring the pathologist and clinician into closer harmony

MICROSCOPICAL EXAMINATIONS

In sending specimens of urine or films of urethral secretion or urine threads from cases of suspected gonorrhœa, the pathologist should be asked to report on the presence of (*a*) gonococci, (*b*) other micro-organisms, and (*c*) pus and epithelial cells. As regards gonococci, the report may be negative or positive. One negative report is of no value whatever in excluding gonorrhœa. It is a common event in old cases of gonorrhœa to fail to find gonococci in urethral

discharge, or in threads and eventually to find a clump of them almost by accident. If the case is one which has at some time been diagnosed gonorrhœa on sufficient grounds and the question is one of cure or not, the finding of pus-cells with the absence of other micro-organisms is a suspicious circumstance which demands a further search for gonococci

Sometimes the report states that gonococci were not found and practically no pus-cells, but large numbers of other micro-organisms and of epithelial cells. One would usually infer from this a superficial catarrh of the mucous membrane, probably due to a mixed infection, and take steps to get rid of the latter In these cases, a great deal often depends on the source of the specimen. If it has been scraped up from the fossa navicularis, the finding of large numbers of other micro-organisms is usually of very little significance, since this often occurs in cases which are innocent of gonococcal infection

There is little to be said regarding the finding of gonococci if the pathologist states the fact definitely Its interpretation is obvious Sometimes, however the pathologist hedges, and the matter may be more difficult. If he reports to the effect that he has found numbers of intra cellular diplococci which are indistinguishable from gonococcus it usually means that he really believes that they are gonococci but does not intend to spoil his reputation for care and accuracy by the odd chance of their being micrococcus catarrhalis or perhaps meningococci which are microscopically indistinguishable. If the clinician took the specimen from the male urethra under proper precautions and requires the information only for treat ment purposes he will be safe in interpreting gonococci from such a report If the matter is of legal importance, however he must have elaborate cultural and other tests carried out.

Sometimes the report states that numbers of Gram negative diplococci many of them indistinguishable from

gonococci, but mostly extra-cellular have been found besides other micro-organisms. In this case it is wise to be cautious, since it is a common event to find in a specimen from a case of mixed infection, staphylococci which are Gram-negative, and odd examples of them may look uncommonly like gonococci. Short stout bacilli are often found which have divided transversely before they have attained any length, and even these may look quite like gonococci. In many of these cases I have seen one half of the diplococcus Gram negative and the other half Gram positive. The best plan is to get rid of the mixed infection and then to send another specimen.

Reports on specimens of urine which have stood for some hours before the examination are of no value. Unless they have been taken and stored under perfectly aseptic conditions they quickly become menageries of micro-organisms in which it is quite impossible to say which predominated when the specimen was taken.

Reports on Exudate from Suspected Syphilitic Lesions

A report that Spirochæta pallida has been found means, of course, that the lesion is syphilitic.

A negative finding may be due to various causes, besides the absence of syphilis; the principal of these are as follows: (1) The patient may have been applying an antiseptic to the sore. For this reason it is well to enquire about the application of antiseptics before taking the specimen. If such have been used, one would resort to gland puncture or obtain the serum from the deeper layers or apply a boiled water dressing and wait for two or three days before taking the specimen. (2) The lesion may be syphilitic, but one which is not likely to yield spirochætes, such as a late syphilide. (3) The report may be negative, the specimen properly taken, and no antiseptics have been applied, yet the patient subsequently shows signs of

syphilis. It generally transpires in these cases that the infection was a mixed one. The patient developed a soft chancre a few days after exposure to a double infection, and the syphilitic element in it was only incubating at the time the specimen was taken. On account of this possibility it is wise in all cases of venereal sore where a diagnosis of syphilis is not made at once to keep the patient under observation and test him for syphilis for not less than two months after his first appearance. Even then, odd cases will be missed, but the period of observation recommended is sufficient to discover the very great majority of syphilitic infections when partially hidden by earlier developing chancroids.

Reports on Specimens of Blood Serum sent for the Wassermann Test

The serum is submitted to the Wassermann test for various reasons, which may be divided into the following categories (1) For diagnosis in a case in which there is no definite history of syphilis. (2) In early cases of chancre when syphilis has already been diagnosed, to ascertain approximately how far the infection has progressed (3) In cases of syphilis where it is desired to ascertain the effect of treatment, and the question of cure has arisen. In other words to assist in forming an opinion as to whether or not the infection still persists

The interpretation of reports on Wassermann tests may be considered under each of these headings.

(1) *For a Primary Diagnosis* —The interpretation and value of the report depend on many circumstances.

A negative report is usually of little value in excluding syphilis, since there is practically no stage of syphilis in which 100 per cent of positive reactions are obtained. In conjunction with clinical signs and the history it may however be of some value, particularly if it is repeated. The following table shows the combined

results obtained in different stages of syphilis by a number of workers.

Stage	Number of Cases.	Per cent. Positive.
Primary	2,496	89·4
Secondary untreated	2,449	97·1
all cases	4,356	90·1
Latent, untreated	196	77·9
all cases	4,829	45·6
Tertiary untreated	[illegible]	96·4
all cases	1,809	83·0
Tabes, untreated	25	100 0
treated	811	66 0
General paralysis	577	97 2
Congenital, with manifest symptoms	394	90·9
latent	34	82·3

The percentages of positive reactions shown in the table are probably slightly lower than those which would be obtained if all had been tested within the past three or four years, since they include numbers of cases which were tested in the early days before the technique had been so finely adjusted as it is now Still, the table will serve its present purpose of showing the comparative values of negative results.

In the clinical examination of a patient, one arrives at some conclusion as to the approximate age of the infection should the case prove to be one of syphilis, and one also gathers information regarding previous treatment. Both factors, as will be seen from a study of the table, affect the value of a negative reaction. Thus, assuming that the clinically ascertained facts establish that, if syphilis at all, the case is in the early primary stage, a negative reaction would be of no diagnostic value whatever Say however that the patient were left without specific treatment, and at the end of two months or so the reaction were still negative, no other suspicious signs having appeared, one would then be justified in using the negative reaction to complete the exclusion of syphilis from the diagnosis.

Assuming that the diagnosis rested between florid secondary or tertiary syphilis and some other disease if the patient had received no treatment previously a

negative reaction would be of great value, especially if it were repeated It could not alone, however exclude syphilis. Again in a case where a patient showed extensive lesions and had not been treated, one would hardly expect a negative Wassermann reaction if the lesions were syphilitic. On the other hand it is a very frequent occurrence to obtain a negative reaction in cases of syphilis where there is just one small lesion such as, for example an ulcer on the side of the tongue.

In cases where the symptoms pointed to syphilis of the central nervous system syphilis should never be excluded on the score of a negative Wassermann reaction of the serum It is possible to have the gravest nerve disease and the serum reaction be persistently negative. In all such cases the cerebro-spinal fluid should be examined

Previous specific treatment generally reduces the value of a negative reaction but may enhance it under special circumstances thus If the patient has received a dose of salvarsan or similar remedy a few days previously this would have the effect of provoking any latent syphilitic process to temporarily increased activity The exacerbation of clinical symptoms which results from the first dose of a specific remedy has long been known as the Jarisch Herxheimer reaction. It is manifested in the blood-serum by the conversion of a negative to a positive reaction or the strengthening of a previously positive reaction. This provocative effect is often seen when patients are tested week by week. In a series of primary cases with negative reactions it is a common event to find the reaction definitely positive a week after the first injection. The provocative effect of a single dose of one of the newer arsenical remedies is commonly made use of now to enhance the value of a negative reaction.

Doubtful reactions sometimes designated weak positive or weak negative, should be looked on as negative from the point of view of primary diagnosis, but steps should always be taken to settle the matter Sometimes

th patient has (possibly without knowing it) been taking an anti-syphilitic remedy. In this case a doubtful reaction would be highly suspicious, though insufficient for a diagnosis. One method of arriving at a conclusion would be to administer a small dose (0·3 grm.) of salvarsan or similar remedy and to test the blood, two, seven, thirteen, and twenty one days after. If only one test were practicable I would choose that on the seventh day after the provocative injection.

Positive reactions require little discussion. *Provided that the test is carried out according to the principles of the original method* a definitely positive reaction indicates that the patient is suffering from syphilis, with the following reservations. A positive reaction has been reported by various workers in the following non-syphilitic diseases: (1) yaws, ( ) leprosy (chiefly tuberous) (3) trypanosomiasis, (4) relapsing fever (5) malaria, (6) scarlet fever (7) tropical ulcer (8) pellagra, (9) beri-beri, (10) pneumonia, (11) late tuberculosis, (12) diabetes mellitus, (13) typhoid fever and (14) malignant tumours. A positive reaction has occasionally also, been given by the serum of persons *in articulo mortis* and by that of quite a large percentage of corpses, while in a few cases the sera of patients under general anaesthesia and of those in eclampsia have been positive.

Of the diseases mentioned above, yaws, leprosy trypanosomiasis, relapsing fever and tropical ulcer are little likely to be encountered in this country or with the exception of yaws to give any trouble in diagnosis. In the cases of pellagra, beri-beri, pneumonia, late tuberculosis, diabetes, typhoid fever and malignant tumours, the results as to positive reactions are isolated and unconfirmed by other workers, and it is more than probable that in most of them the patient was also suffering from syphilis. The only questions likely to arise in this country concern scarlet fever and malaria. Scarlet fever has now given the reaction in just over 5 per cent. of cases, and

most of those were obtained by a technique which is not now employed. **Malaria** appears in some hands to have given the reaction, but only at the height of the fever. I have tested the sera of many patients who have suffered at some time or another from malaria, but, apart from syphilis, have not obtained a positive reaction.

Three other conditions which are not mentioned above, demand closer attention because they are skin diseases which may resemble syphilis and in some laboratories may give a positive reaction. They are **psoriasis, urticaria pigmentosa, and erythema iris.** I have often seen cases of psoriasis which gave a partial reaction and have, myself, so graded the test that this partial reaction is avoided. I have also seen cases of psoriasis diagnosed syphilis, on the strength of positive reactions obtained in good laboratories. I have experience of only one case each of urticaria pigmentosa and erythema iris in which a positive reaction was obtained in another laboratory, but since in each case the laboratory was one where the worker's skill was beyond doubt, it is necessary to give a word of caution with regard to positive reactions in these diseases.

Excluding the above-mentioned diseases, one can say that a positive reaction justifies a diagnosis of syphilis. But that is all. *It does not justify the labelling of every* single abnormality to be found about the patient as syphilitic. It is necessary to mention this very obvious fact because of a tendency which has grown up since the *Wassermann test* was discovered to allow a positive reaction to over-ride every other piece of evidence in the diagnosis of particular lesions. A patient with a history of syphilis, for instance, has a patch of seborrhœa, or a crop of herpes on the side of his tongue. A Wassermann test is carried out, the reaction is found to be positive, and the seborrhœa or the herpes, according to the case, is forthwith diagnosed as a syphilitic recurrence, often to the greater misery of the patient.

( ) The Wassermann test is valuable in cases of primary syphilis in showing how far the disease has advanced. It influences the prognosis in this respect, that, if the reaction is still negative when treatment is commenced, the amount of treatment eventually required will usually be much less than if it were positive.

As a supplement to this test, if the result is negative it is valuable to have another carried out a week after the first injection of salvarsan, or similar remedy In cases which have almost reached the positive stage the reaction will be provoked by the first injection to a definite positive. On this principle, one can classify primary cases thus:

Negative, reaction at the time of the first injection of salvarsan and negative week later	Early primary
Negative reaction at time of first injection but positive week later	Medium primary
Positive reaction at time of first injection	Late primary

On a given line of treatment the results as regards subsequent freedom from clinical relapse, or positive Wassermann reaction would be found to be in the above order of merit.

(3) *The Wassermann reaction in deciding the immediate effect of treatment and in determining the question of cure* — There is no doubt that the Wassermann test, in conjunction with clinical signs, i a far better guide to the immediate effect of treatment than clinical signs alone.

In those primary cases where treatment commences before the Wassermann reaction has become positive it is, of course, true that, with the exceptions mentioned above under (2) the behaviour of the Wassermann reaction is of little value at first from this point of view since it remains negative while clinical signs are still present. In cases, however where the treatment commences when the Wassermann reaction is already positive, the amount which is required to cause clinical signs to disappear is almost always much less than that which will render the

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within a day or two of an injection, gave a completely negative reaction.

In determining the question of cure, partial or doubtful reactions should be accepted at once as evidence that more treatment is required. With regard to negative reactions, the question arises how often should the blood be tested, and for how long after suspending treatment.

As to the intervals, one would at least test at the end of the selected course of treatment, every three months during the first year and every six months afterwards until satisfied that a cure has been effected. At the end of nine or twelve months, eighteen months, and two years, each test would be preceded by a provocative injection, as mentioned above when discussing the interpretation of doubtful reactions in diagnosis. Naturally it would be an advantage to test two or three times during the course of treatment, since it is useful to know at what date the reaction first becomes negative. Also, more frequent subsequent tests would enable a closer watch to be kept, but these and the tests during the course of treatment may not be practicable. As to the minimum period of subsequent observation, it is a very difficult question to answer at present, since the Wassermann test has not been long enough in routine use to inform us. There is no doubt that much depends on the stage of the disease when treatment was commenced. Judging from my own experience, if the patient was in the early primary stage and remained negative for a year even after provocative injections, it seems improbable that the reaction would become positive afterwards. If though still a primary case, the reaction was positive, and still more so if the rash had made its appearance, the reaction might remain negative for nearly two years, and then return to positive.

If the patient has relapsed once after a given line of treatment, or is in a later stage than the above, one can give no assurance that the reaction will not quickly return

reaction negative. Briefly after the primary stage the Wassermann test can usually look deeper into the patient than the naked eye, and a treatment which will convert a positive reaction to negative is much better than one which is only just sufficient to cause the disappearance of clinical signs

The question arises, can we consider a line of treatment which is just enough to convert the reaction to negative, sufficient to cure the patient? For the answer to this question it is necessary only to remember that in early primary syphilis we have ocular evidence of the presence of living spirochetes in the patient while the Wassermann reaction is negative If this can happen in primary syphilis it can happen in other stages, so that disappearance of the reaction does not necessarily mean death of all the spirochætes We infer from a positive reaction general activity of spirochætes in the body and from its conversion to negative in response to treatment, a stoppage of that activity but not necessarily complete annihilation of the parasites An indication in fact, that the treatment is affecting the spirochætes injuriously but that is all we can tell only by experience and subsequent observation how much further treatment is necessary to insure the destruction of every spirochæte in the body

Experience has shown that a negative Wassermann reaction just at the end of a course of treatment is a better indication of its effect than one which the serum may give a month later A patient may be positive at the end of a course, but negative a fortnight or a month later The reason probably is that, when the parasites have not been killed off or damaged sufficiently the last injection like each of its predecessors has a provocative action. This stirs the spirochætes into temporarily increased activity which is reflected in the Wassermann reaction.

In using the Wassermann test as a guide to treatment of early cases, therefore, one would certainly continue for some time beyond the stage when the blood serum taken

within a day or two of an injection, gave a completely negative reaction.

In determining the question of cure, partial or doubtful reactions should be accepted at once as evidence that more treatment is required. With regard to negative reactions, the question arises how often should the blood be tested, and for how long after suspending treatment.

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If the patient has relapsed once after a given line of treatment, or is in a later stage than the above, one can give no assurance that the reaction will not quickly return

to positive if treatment is suspended for any length of time

Summary—From the above general remarks it will be gathered that, although the Wassermann test looks deeper into the patient's condition than the naked eye, it is not an absolute guide to a decision regarding the absence of syphilis. The table on pp 282–4 may serve as a guide to the inference to be drawn from the results of Wassermann tests under different circumstances.

Cerebro-spinal Fluid.—As already mentioned when symptoms point to disease of the central nervous system, *it is not sufficient to examine only the blood-serum. This* may easily be positive while the cerebro-spinal fluid is negative and vice-versa. Also in deciding the question of cure, the examination is incomplete until the cerebro-spinal fluid has been examined.

The examination usually relates to (1) the number of cells and their character (2) the presence of excessive globulin, (3) the Wassermann reaction and possibly (4) Lange's gold reaction.

As to these (1) *It is usually recognised that more than* ten cells per cubic millimetre is pathological. In syphilis of the central nervous system the number of cells, chiefly lymphocytes varies very greatly (10–500 per c.mm.). Excess of lymphocytes is not diagnostic of syphilis since it occurs also in other diseases, tubercular meningitis, for example, but it is a valuable indication of disease, especially when used in conjunction with other pathological findings. Little can be inferred from the number of cells as to the *exact nature of the syphilitic process* but, on the whole in meningitis the number per c.mm is greater than in tabes and general paralysis. *The number of cells is much more* easily reduced to normal limits by treatment than is the Wassermann reaction. (2) **Globulin** cannot be demonstrated by ordinary tests in normal fluid It is often excessive in syphilis of the central nervous system but like lymphocytosis its presence does not necessarily indicate

that the pathological process is syphilitic. (5) A positive Wassermann reaction is diagnostic of syphilis, but leaves one in the dark as to *the exact nature of* the process. On the whole, the reaction is strongest and more constant (practically 100 per cent.) in general paralysis. It is usual now to test the fluid in much greater amounts, relatively to the other *constituents* of the test, than was formerly the practice. This has had the effect of increasing very considerably the proportion of cases which give a positive Wassermann reaction, and of increasing the value of the test as a guide to treatment. Thus, whereas formerly the same amount of fluid was used as it is usual to take of serum in the blood test, varying amounts up to ten times this quantity of *fluid are now employed*. This point may be illustrated by the following examples of formulæ which might, after standardisation of reagents, be used for the testing of specimens of blood-serum and of cerebro-spinal fluid on a given day. The examples are not to be taken as a guide to the technique of the Wassermann test.

QUANTITIES OF CONSTITUENTS USED IN THE DIFFERENT TUBES

Constituents	Serum Test	C.S. Fluid Test			
		(10)	(5)	(2.5)	(1)
Serum	0.2 c.c.	—	—	—	—
C.S. Fluid	—	2 c.c.	1 c.c.	0.5 c.c.	0.2 c.c.
Antigen	0.2 c.c.	0.2 c.c.	0.2 c.c.	0.2 c.c.	0.2 c.c.
Complement	0.1 c.c.	0.1 c.c.	0.1	0.1 c.c.	0.1 c.c.
Sensitised blood cells, added after preliminary incubation	1.0 c.c.	1.0	1.0	1.0 c.c.	1.0 c.c.

It will be seen that only one constituent, the C.S. fluid, varies in the above table. The columns which relate to the constituents of the fluid test have been headed (10) (5) (2.5) and (1) to indicate the multiples of fluid relative to serum in the standard test which are used *in the different* test tubes. In such a test as the above the weakest reaction would be one where only the (10) tube was positive, the

INTERPRETATIONS OF WASSERMANN TESTS OF BLOOD-SERUM

OBJECT OF TEST TO ASSIST IN THE DIAGNOSIS OF A CASE OF SUSPECTED SYPHILIS

Probable stage of Syphilis in event of the latter being diagnosed	Report.	Inference.	Recommendation.
Primary	Positive Doubtful Negative	Syphilis Possibly early syphilis Possibly not syphilis Nil	Commence treatment Give provocative injection and re-test serum R peat weekly f r two months
Secondary not previously treated	Positive Doubtful Negative	Syphilis Nil Probably not syphilis	Commence treatment Repeat tests afte provocative injection
Secondary previously treated but history and nature f previous treatment uncer tain	Positi Doubtful Negative	Syphilis Very suspicious f syphili Nil	Re-commence treatment and advise much more than in the first instance Repeat test aft provocative injection R peat test fter withh lding all specifi treatment f a month ; aft a provocati e injection
Latent, n previous treatment	Positive Doubtful Negative	Syphilis Nil Probably not syphilis	According to circumstances see p 4*0 Repeat test afte provocative injection

Latent, previously treated but history and nature of previous treatment uncertain	Positive Doubtful Negative	Syphilis Very suspicious Nil	According to circumstances, see p. 420 Repeat test after provocative injection
Tertiary	Positive Doubtful Negative	Syphilis Very suspicious Nil	Commence treatment Repeat tests after provocative injection
Disease of central nervous system	Positive Doubtful Negative	Nil, as regards disease of central nervous system	Examine cerebro-spinal fluid

OBJECT: TEST TO ESTIMATE THE AGE [illegible] A P [illegible] FOR WHICH HAS [illegible] ALREADY BEEN DIAGNOSED

Report.	Inference.
Positive before first injection.	Late primary
Negative before, positive after first injection.	Medium primary
Negative before and after first injection.	Early primary

OBJECT OF TEST TO ASSIST AN OPINION AS TO THE NECESSITY FOR FURTHER TREATMENT

Stage of disease when treatment commenced.	Date of test with relation to course of treatment	Report.	Recommendation.
Early primary	End of 7-day course	Negative	Test at end of course and at intervals of three months for at least a year with preceding provocative injections at nine and twelve months
Medium and late primary	Middle of 100–110-day course	Positive, Doubtful	Give a follow up course a few weeks after the termination of the first
		Negative	Test at end of course and again at three-monthly intervals for at least a year
	End of 100–110-day course	Positive, Doubtful	Repeat whole course after an interval of about two months
		Negative	According to behaviour in middle of course
	Three, six, nine and twelve months after last injection	Positive, Doubtful	Recommence treatment
		Negative	Continue tests as in Early primary
Secondary	End of 100–110-day course	Positive, Doubtful	Repeat whole course after an interval of about two month
		Negative	Short follow up course after three or four weeks
	Three, six, nine, twelve, eighteen and twenty four months after last injection	Positive, Doubtful	Re-commence treatment
		Negative	Continue test for at least two years, with provocative injections at end of nine, twelve, eighteen, and twenty four month from date of last injection
Later stages	End of 37-day course	Positive, Doubtful, Negative	Give repeated short courses at intervals increasing from eight weeks to six months for two or three years

rest being negative. A case of general paralysis would give a positive reaction in all the tubes, including (1) and many cases of tabes and syphilitic meningitis would behave similarly but not in such a high proportion as the first-named.

If the fluid is tested on the above principle at intervals during treatment, the effect of this is seen in reduction of the number of tubes which show the reaction. Thus a case of meningitis might give a reaction in all the tubes at first, but after receiving say 5 grm. of "606, might easily show positive in (10) doubtful in (5) and negative in (2 5) and (1). Actually in general paralysis the reaction is stubborn in tabes it is rather more amenable and in syphilis of the supporting structures it is not very difficult to attain negative in (5), (5) and (1) though the reaction in (10) is particularly difficult to abolish.

(4) Lange's gold test is believed to be specific for syphilis, but is still on its trial.

Absence of pathological changes in the cerebro-spinal fluid does not necessarily indicate freedom from disease since in cases of syphilitic arteritis of cerebral vessels there may be no changes in the fluid.

The effect of treatment on pathological changes in the fluid has been considered, and it remains only to say that these remain long after clinical symptoms have disappeared. The aim should be to continue treatment until they have also been abolished. Then, although a completely negative fluid is not an absolute indication that the disease has been completely eradicated, considering that occasionally it relapses and cases of arteritis without other disease may provoke no pathological changes in the fluid, it must be reckoned as of good augury for the future. In support of this, we have the well known fact that the majority of cases of secondary syphilis have pathological fluid, yet only a fraction of these subsequently developed central nerve disease. How much more hopeful must be the outlook for those whose parasites have been fought until they are no longer active in the central nervous system.

OBJECT OF TEST TO ASSIST AN OPINION AS TO THE NECESSITY FOR FURTHER TREATMENT

Stage of disease when treatment commenced.	Date of test with relation to course of treatment	Report.	Recommendation.
Early primary	End of 7 day course	Negative	Test at end of course and at intervals of three months for at least a year with preceding provocative injections at nine and twelve months
Medium and late primary	Middle of 100–110-day course	Positive Doubtful	Give a follow up course a few weeks after the termination of the first
		Negative	Test at end of course and again at three-monthly intervals for at least a year
	End of 100–110-day course	Positive Doubtful	Repeat whole course after an interval of about two months
		Negative	According to behaviour in middle of course
	Three six, nine and twelve months after last injection	Positive Doubtful	Recommence treatment
		Negative	Continue test as in Early primary
Secondary	End of 100 110-day course	Positive Doubtful	Repeat whole course after an interval of about two month
		Negative	Short follow up course after three four weeks
	Three six nine twelve eighteen, and twenty four months after last injection	Positive Doubtful	Re-commence treatment
		Negative	Continue test for at least two years with provocative injections at end of nine twelve eighteen, and twenty four months from d to f last injection
Later stages	End of 57-day course	Positive Doubtful Negative	Give repeated short courses at interval increasing from eight weeks to si months f two three years

indulged in an orgy of sexual intercourse so that the last acts have been prolonged, or if he has failed to apply an antiseptic lubricant in the shape of say calomel ointment to his glans penis and fossa navicularis before bringing these into contact with the infected vagina, it is wise not to trust to simple washing but to supplement this by a more definite attack with some antiseptic. For this purpose, one of the silver preparations, permanganate of potassium, or calomel cream is usually chosen.

Assuming that a patient applies for advice within a few hours or a day of exposure, the following plan would probably abort the disease in the great majority of instances. Wash the glans penis with spirit, or with 1/2 000 mercury perchloride or biniodide. Irrigate the anterior urethra with 1/3,000 permanganate of potassium as directed below (p. 300), and instil into the urethra one of the following: ° per cent. protargol, 5–10 per cent. argyrol, or 30 per cent. calomel cream of fluid consistency.

Argyrol, protargol, and similar organic preparations of silver should always be freshly prepared by sprinkling the powder on the surface of cold, distilled water.

If the patient has allowed a longer period to elapse, and there is evidence that the gonococcus has begun to act more deeply so that there is some itching or burning at the meatus and perhaps a slight mucoid discharge it is necessary to prolong the treatment. Many abortive treatments have been devised for this stage of the disease. Some of them are so drastic that they must be distinctly harmful and almost worse than the disease itself, but the following plans are rational and safe, provided that they are not persevered in too long.

(1) (a) After the patient has urinated, wash the glans penis and meatus with perchloride lotion, or with spirit, and irrigate the anterior urethra, as shown below with 1/3,000 permanganate of potassium, or 1/500 argyrol. (b) Inject into the urethra about 4 c.c. of a 10 per cent solution of argyrol and instruct the patient to hold it there for

CHAPTER XVIII

THE TREATMENT OF GONORRHŒA—GENERAL MEASURES

The treatment of gonorrhœa may conveniently be considered from the points of view of the urethritis and local complications, and of metastatic complications

The treatment of the urethritis depends largely on the stage it has reached by the time the patient presents himself for advice, and from this point of view gonorrhœa may be divided into three main periods (1) The very earliest stage, before the gonococcus has penetrated into the depths of the mucous membrane behind the fossa navicularis This may generally be said to commence with the minute after the exposure to infection, and to end with the appearance of a purulent discharge It is without doubt the most hopeful stage at which to commence treatment. (2) The acute and subacute stages, which occupy the first month or six weeks (3) The chronic stage. To deal with these stages in the order named.

THE EARLIEST STAGE —As mentioned this is the most hopeful one at which to commence treatment. The gonococci are still on the surface of the glans or the mucous membrane of the fossa navicularis, and at this time too the mucous membrane of the urethra will tolerate much stronger antiseptics than can be applied later Probably in the majority of instances, simple washing with soap and water would suffice to remove the gonococci within an hour or two of infection, but this depends largely on the precautions which the patient has taken beforehand to avoid intimate contact with the virus. If he has

English gauge. The bougie is dipped in eucalyptus oil and pushed into the urethra as far as it will go, after which a small dressing is strapped over the meatus. The patient is instructed to retain it as long as possible. The treatment is repeated after twelve hours, but not again.

(4) The following which is a modification of the method recommended by Ballenger has proved very successful. The patient empties his bladder and 20 minims of a 5 per cent. solution of argyrol are injected into the urethra. The solution is imprisoned within the urethra by grasping the penis behind the glans, so as to compress the urethra. The meatus is thoroughly dried and some collodion flexile brushed between its lips, after which they are allowed to fall together. The meatus is further sealed with three coats of the collodion, each of which is allowed to dry before the next is applied. The compression of the urethra is then cautiously relaxed, and it helps to preserve the seal if the penis is kept in the erect position. The solution should be retained for at least four hours, and the treatment may be repeated on three successive days. It may be followed up by daily irrigation with potassium permanganate for five more days.

Acute and Subacute Stages.—Unfortunately at present the great majority of patients appear for advice long after any of the above forms of treatment can be applied with safety and when the task of treatment has become a much more difficult one. Until the general public has learnt, as it should, not to allow the golden opportunity of aborting the disease to slip by so long will there be much in the saying that it is only the first attack of gonorrhœa which is incurable. When it has learnt the lesson thoroughly there will be a considerable reduction in the size of *text books on gonorrhœa*.

The treatment of gonorrhœa in the acute and subacute stages may be divided into general and local, of which the former may be considered first.

twenty minutes (c) Repeat the irrigation and injection twice daily for three days, and continue with irrigations for five days longer

(2) The following plan, recommended by Janet, is applicable within forty-eight hours of the first appearance of any discharge.

The urethra is irrigated with permanganate of potassium solution in the strengths and at the hours shown in the table below which is extracted from Luys' work on gonorrhœa

Day	8 a.m	Noon.	8 p.m.
1st	—	Anterior 1/1 000	Ant rior 1/1 000
2nd	Anterior 1/3 000	—	1/4,000
3rd	Anterior and posterior 1/2,000	—	Anterior and posterior 1/4 000
4th	—	Anterior and posterior 1/* 000	—
5th	Anterior and posterior 1/* 000	Ditto, 1/2,000	Anterior and posterior 1/4 000
6th	Ditto 1/1 000	Ditt 1/*,000	—
th	—	Ditt 1/1 000	—
8th	—	Ditto, 1/1 000	—
0th	—	Ditto 1/1,000	—
10th	Anterior 1/1 000	Ditto, 1/1 000	—

Notes —Anterior means irrigation of the urethra as far as the compressor urethræ Anterior and posterior means irrigation into the bladder For technique of irrigation see p. 306

The permanganate of potassium is believed to make the urethral mucous membrane an unsuitable medium for the growth of the gonococcus, which dies out if not washed away The above strengths are not at all applicable after the urethra has become acutely inflamed, and none of the plans so far described should be attempted if the discharge is already purulent by the time the patient appears.

(3) Cheyne and Burghard recommend the introduction of a soluble bougie which has met with great success. The bougie consists of iodoform gr v ol. eucalypti ♏ 10 ol. theobrom q s to make a cylinder 4½ inches long of No 10

FIG. [illegible]. A simple form of suspensory bandage. (Designed at Rochester Row by Staff-Sergeant Smith, R.A.M.C.)

GENERAL TREATMENT.—The general treatment of gonorrhœa has regard to the facts that the acutely inflamed urethra is easily irritated by urine passing over it, *that the* sexual centre is very easily stimulated, and that the irritated nerves may provoke antiperistalsis in one or other ductus ejaculatorius, which carries the infection back to the seminal vesicles and epididymis.

The patient should rest during the acute stage, on a hard bed, and it is almost universal routine in the Army to order gonorrhœa patients to bed for the first week or ten days. The best position is three-quarters prone, with the penis lying in the undermost groin and the upper knee flexed. When for any reason rest in bed is impracticable the patient should exert himself as little as possible and avoid soft seats. As an adjunct to the rest treatment, a well-fitting suspensory bandage is valuable for the support of the testicles. The ordinary net variety of bandage is useless for the purpose of supporting the testicles and one made on the plan illustrated in fig. 63 is far better so long as it is made to fit. The illustration is self-explanatory; when the sides *BC* and *BD* are sewn together the result is a shallow bag of roughly triangular shape. The apex of the triangle is applied to the centre of the perineum and fixed there by passing one of the tapes shown round each thigh and up under the waist band. A piece of cotton wool is laid in the bag and then the latter is pulled upwards over the scrotum. The penis is passed through the hole provided and the base of the triangle fastened over the pubis by means of the tapes which pass round the waist to fasten off in front. A similar pattern of suspensory bandage which can be obtained from the surgical instrument makers is illustrated in fig. 64. An elaborate form of this bandage is provided with a flap stitched below and to one side of the hole for the penis. Its purpose is to support the penis either on the pubis or in the groin, instead of allowing it to hang down. Such an arrangement assists drainage, since it straightens out the peno-scrotal angle

for most cases. The fact that alcohol in some form or other is a popular test of cure sufficiently indicates its position in, or rather out of the dietary of a patient suffering from acute or subacute gonorrhœa. Pickles, spices, and spiced foods generally come under the same ban, and, to sum up, one would say that a plain, wholesome food, with its energy value mainly derived from fats and carbohydrates, is best for these cases.

Mental diet is also important. An extensive experience of the young man suffering from gonorrhœa shows that, unless he is checked, he tends to decorate his walls with pictures and to read literature of the sexually stimulating variety. As mentioned, the disease is itself sexually stimulating and, since sexual excitement is bad for an inflamed urethra, it is well to direct the patient's mind as far as possible from such matters. Probably the best method of doing so is to set the patient a task against time which involves considerable mental concentration, and to forbid novels of any description. The problem of mental diet is not the least difficult of those connected with the treatment of gonorrhœa.

Medicines are prescribed in gonorrhœa with various objects. These may be divided into (1) sedative, ( ) antiseptic, and (3) anti-gonococcal, so-called.

A mixture on the following lines will be found useful, as it soothes the neck of the bladder and posterior urethra both directly and by making the urine alkaline. Gonococci dissolve in alkali, as shown by Captain D Thomson, so that mixtures which promote alkalinity of the blood and urine are anti-gonococcal. Local remedies should whenever possible, also be alkaline.

℞.

Potass. Bicarb.	gr xv	
T Hyoscyam.	min. xv	
T Buchu	min. xx	
Inf. Uvæ Ursi ad	℥ i	M

Sig.—One ounce to be taken three times day

and prevents the pus being dammed back behind this point That pus can be held up under pressure behind the peno-scrotal angle when the penis is in the pendulous position, is shown by the fact that in many cases of gonorrhœa it may be impossible to obtain any but a scanty discharge from the meatus until the penis is held up when the pus wells freely out from the meatus, though it has to travel upwards The meatus should be cleansed frequently with a weak antiseptic lotion, and the penis worn in a bag containing some cotton-

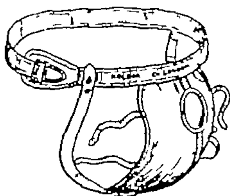


Fig 64. Jullien's suspensory bandage.

wool, which should never be allowed to dry on and seal the meatus.

Diet is important for many reasons A full, rich diet is excreted as irritant matter in the urine and maintains the *urethral irritation.* Further it is *sexually stimulating and tends to cause erections,* which are not only painful but *damaging to the urethral tissues* During the first week a diet of milk and milky puddings with bread and butter and weak tea, are best, and these may be supplemented with barley water *ad libitum* in order to promote a copious flow of bland urine. Throughout the course of the acute and subacute stages, it is wise strictly to limit the meat, and four to six ounces daily should be sufficient

As adjuvants to these remedies in the case of erections may be mentioned the application of cold water to the turgid penis; but the best treatment is prophylactic in the form of diet, and the forbidding of sensual literature, etc.

Antiseptics include such as are commonly prescribed in genito-urinary diseases. Amongst others may be mentioned Hexamethylene tetramine, formerly sold as Urotropine and as Cystopurin Salol Salicylic acid and Boric acid.

It is rather difficult to understand how an antiseptic which arrives in the urine in such a dilute form as these can have any great influence on anterior urethritis, though possibly they may favourably influence the course of posterior disease owing to the long periods during which the urine may remain in contact with the posterior urethra. Hexamine, which is excreted as formalin, requires that the urine be acid in order that the formalin may be disengaged, and if the urine is alkaline it is usual to prescribe it with sodium acid phosphate thus

℞.

Hexamine Tetramine	gr x	
Sod. Acid. Phosph.	gr xx	
Aq ad	℥	M.

Sig.—One ounce to be given three times a day

Formalin is an irritant to mucous membranes, and the urethra is no exception to this rule, so that it is not surprising that symptoms of irritation sometimes follow its use in gonorrhœa. Boric acid is often useful, but more particularly so in older cases, where, possibly as a result of instrumentation, the contents of the bladder have become septic. It may be combined in the acute stages with Inf. Uvæ Ursi, or at a later date with Strychnine.

The remedies which are believed or advertised, to have a specific effect on gonorrhœa are preparations of Copaiba, Cubebs, Sandal-wood oil, and Kawa kawa. They are usually prescribed after the acute symptoms have some-

As a prophylactic against epididymitis, atropine and belladonna are valuable, thus

	℞		
(1)	Ext. Belladonn.	gr ¼	
	Ext. Opii	gr ½	
	Butyr Cacao	gr xv	M.
	Fiat Suppositor	i	

Sig.—One suppository to be used night and morning.

Or better

	℞.		
(2)	Atropin. Sulph.	gr 1/50	
	Excipient q.s. ad	gr xv	M.
	Fiat Suppos.	i	

Sig.—One suppository to be used night and morning.

Atropine was shown experimentally by Schindler to prevent the wave of antiperistalsis along the vas, which may follow irritation of the posterior urethra. He believed this antiperistalsis to be the mechanism by which the gonococci are carried to the epididymis.

For painful erections, chief reliance is placed on the bromides camphor lupulin antipyrine and atropine, as illustrated in the following

	℞.		
(1)	Camphor Monobrom.	gr vi	
	In cachet	i	

Sig.—One cachet to be taken thrice daily

	℞.		
(2)	Camphor	gr i	
	Lupulin	gr 1½	
	Excip. q.s. ad	gr v	M.
	Fiat Pil.	i	

Sig.—One to two pills to be taken three times a day

	℞.		
(3)	Antipyrine	gr xx	
	Tinct. Opii	m. x xx	
	Aq. ad	℥ iv	M.
	Fiat Enema.		

Sig.—The enema to be administered at bed-time.

have been attained by the exercise of painstaking research and the installation of most expensive machinery The literature round the packages is calculated to inspire the reader with the most joyous hopes, but the plain fact is that not one of them is a cure for gonorrhœa.

Vaccines.—Opinions are somewhat divided as to the value of vaccines in uncomplicated acute and subacute gonorrhœa, and probably most would limit their use to complicated cases such as arthritis, iritis etc. Such a view seems to be illogical, considering that correct vaccine administration should improve the patient's resistance. It is a mistake, too, to imagine that in ordinary gonorrhœa the gonococcus remains confined to the urethra and its immediate neighbourhood. There is considerable evidence, both direct and indirect, to show that in the majority of cases it circulates in the blood. Thus, it has been cultivated numbers of times from the blood of uncomplicated cases, and numbers of instances occur in which a metastatic complication of gonorrhœa affects exclusively some part which has previously received an injury or has been overworked—a sprained ankle, for instance, or an overworked tendon. A good example of the latter was a signaller who, during the course of an attack of otherwise uncomplicated gonorrhœa, developed teno-synovitis of his (over worked) right supinator longus tendon sheath In such cases it is safe to assume that, had it not been for the previous injury the gonorrhœa would have been uncomplicated, and the disease regarded as a purely local one. Allowing that the gonococcus generally does circulate in the blood, it must be right to raise the resistance to the highest point possible, in order that the micro-organism may not have a chance of setting up disturbance in other parts than the urethra. Again, gonococcal vaccine has been proved of value in the treatment of epididymitis, and must therefore be of value in its prevention. It is true that the use of vaccine in acute cases of gonorrhœa does not

what abated Although the discharge decreases under their influence which probably accounts for their popularity they do not cure gonorrhœa They have certain disadvantages which may outweigh any virtues they possess. Thus they tend to upset the stomach and not infrequently cause skin rashes which are erythematous, papular or urticarial Perhaps the commonest of these consists of a number of dark violet to yellow spots, which become confluent Sometimes these remedies provoke albuminuria or even hæmaturia

White recommends a combination of Salol, gr v Oleoresin Cubeb., gr v Para balsam Copaibae, gr v and Pepsin gr i in a capsule of which four to six are taken daily an hour after food. As a change from this Salol, gr iii Ol. Santal. gr iii Oleoresin Copaibae gr iii and Ol Cinnamomi gr i six to ten capsules daily

Copaiba may be prescribed as the oil in capsules, or in the form of the Lafayette mixture, as follows

℞

Balsam Copaib	
Sp. Lavand. Co	
Sp Aeth. Nit.	aa ʒ [illegible]
Liq Potass.	ʒ [illegible]
Ol Gaultheriae	ii
Mucilag. Acac. ad	ʒ iv

Sig—Two teaspoonfuls to be taken in water thrice daily after food.

Cubebs may also be given as a powder in cachets, or as the tincture in doses of 30–60 minims Sandal wood oil is usually prescribed in capsules the dose being 5–20 minims and Kawa kawa as the fluid extract, in doses of 30–60 minims.

Numerous so-called refined preparations of sandal wood oil, etc. are sold under different names Each is supposed to be superior to all its competitors in kindness to the most delicate stomach, in therapeutic power and in freedom from undesirable impurities all of them qualities which

The toxin free vaccine prepared by Captain Thomson can be given in very high doses, corresponding to 500, 750 or 1,000 millions but when working with vaccines prepared from emulsions of whole gonococci which have not been killed by heat I have usually commenced with a dose of five millions, increasing gradually to 150 millions by about the 60th day More recently experience has shown that the dose may be increased more rapidly on something like the following lines:

Days of treatment.	Dose of vaccine in millions.
1st	5
5th	10
8th	25
12th	50
19th	75
26th	100
33rd	150

If any dose is followed by a rise of temperature of more than one degree, by marked increase of urethral discharge, or increase of joint pains, according to the case, the succeeding dose is not increased. If the reaction has *really been a severe one, the succeeding dose should be* reduced.

Some workers have advocated the use of doses which might be called heroic. I have watched cases which have been treated with doses commencing with 750 millions and increasing to 1,000 and 1,500 millions. Sometimes the temperature has risen to 103 F or 104 F after such injections, and, taking the patients as a whole, their progress was not good.

Gonococcal vaccine may not cure a patient of gonorrhœa in the sense of removing the gonococci from him, any more than typhoid vaccine will cure a typhoid carrier but I am convinced that, properly used, it will prevent the gonococci from damaging his tissues so much as they

apparently reduce the duration of the purulent discharge, but the observation of series of parallel cases has convinced me that the vaccine-treated gonorrhœa pursues altogether a milder course than that from which vaccines are withheld

A certain number of good observers have expressed themselves sceptically as to the value of vaccines in any stage of gonorrhœa, complicated or otherwise and it might appear difficult to reconcile their findings with those of others who are enthusiastic on the subject of their value in complicated cases I have seen good bad and indifferent results, and have come to the conclusion that good results follow the use of vaccine prepared from a good immunising strain of gonococci which has not been sterilised by heat, and where a proper dosage has been employed. Bad results follow doses which are too large or too frequently repeated and indifferent results follow the employment of poor strains, or those which have been heated in the preparation of the vaccine.

Concerning these points, there is no doubt that strain and method of preparation make a great difference to the antigenic power of a vaccine. Recently Captain D Thomson (unpublished) working in the Rochester Row Laboratory has shown by the complement fixation test that while emulsions of gonococci are poor stimulators of antibody production vaccines prepared by dissolving the gonococci in alkali and subsequent neutralisation of the solution provoke very definite antibody response. Work on these lines is producing very hopeful results.

Heating appears to be detrimental to the antigenic power of a vaccine and is unnecessary in the case of the gonococcus

The dosage of vaccines is important. Patients vary greatly in the reaction which follows an injection of gonococcal vaccine, and since it is a wise plan not to provoke one which is too severe, it is well to commence with a dose which is likely to be tolerated by the most sensitive patient

drawn, while the flask is held on the slope, say at an angle of 45 degrees with the vertical, and the patient then micturates into the flask at this angle. Keeping the flask at a slope, its mouth is put into the flame of a spirit lamp or Bunsen burner for a few seconds, and at the same time the part of the plug which fits the flask is set alight and extinguished, not by blowing it out, but by screwing it into the neck of the flask. The specimen is sent at once to the laboratory where it is spun out in a sterile centrifugal tube, and the deposit planted on suitable medium by the pathologist. Specimens of secretion obtained from the mouth of the meatus are really of little value for the preparation of vaccine, since they usually contain many varieties of micro-organisms, few of which probably extend farther down the urethra than the limits of the fossa. Before taking the urine specimen, it is advisable to massage the prostate (p 320) in order that micro-organisms lurking there may be captured.

Another form of vaccine treatment has been introduced under the name of Gonorrhœa Phylacogen. It is a mixture of filtrates of gonococcal cultures with those of a number of other micro-organisms. This product was tested thoroughly at Rochester Row some years ago, and found not to give the results claimed for it.

Serum treatment has not given any results of value in the treatment of gonorrhœa and cannot be recommended.

otherwise would and that it is a valuable adjunct to the treatment of gonorrhœa in all its phases.

There is another cause of indifferent results from the use of gonococcal vaccine in the complications of urethritis. That is the fact of the complication not being gonococcal at all but due to some other bacterium, such as a streptococcus. In many cases of chronic arthritis which are associated with urethritis and are attributed to the gonococcus no gonococci are found in the urethral secretion, or in the urine after prostatic massage, and the administration of a vaccine prepared from the other micro-organisms which are found there is often the first step towards a cure

Mixed Vaccines.— A stock vaccine prepared from gonococci with the addition of other micro-organisms which are commonly found in the urethra in cases of gonorrhœa was prepared at No 0 Stationary Hospital by Captains A. Dawson and McWhirter and used in routine work with good effect. The proportion of gonococci to other micro-organisms in this vaccine was 1–2½ and the dosage was calculated on the number of gonococci. It is an imitation of the excellent vaccine introduced by Nicolle and Blaizot of the Tunis Institute, which is sold under the name of Dmégon

In cases of gonorrhœa which have existed for some time and there is evidence of mixed infection, it is a good plan .. cu an autgood stock gonococcal vaccine in combina taminating organismogenous one prepared from the con- pare than an autogeoms. The latter is much easier to pre- tion of such a vaccinenous of gonococci. For the prepara urine in a sterile manno it is probably better to collect the

Having obtained a sterder thus from the laboratory wipe ile flask of about 500 c.c. capacity with spirit, which should becover the glans penis and meatus and then allowed to dry be applied for about a minute cleansed parts after they havt Nothing should touch the this manner The plug of the e been treated with spirit in is flask is flamed and with-

(5) Further if the mucous membrane is irritated unduly when infected with gonococci, the latter are liable to be carried back to the seminal vesicles and the epididymis. Undue irritation is produced by the passage of instruments along the acutely inflamed canal the use of antiseptics which are too strong irrigation of the urethral canal at too great a pressure massage of the prostate while the urethra is still acutely inflamed; and the injudicious massage of the prostate in almost any stage of gonorrhœa.

Local treatment consists in the injection into the urethra of some agent which will either destroy the gonococci on the surface, or wash them away mechanically or so act on the mucous membrane as to make it an unsuitable medium for the growth of the gonococcus. As to the method by which the agent should be introduced, opinions differ somewhat. While some favour the use of a syringe others prefer an irrigator from which the solution is allowed to flow into the urethra.

The syringe appeals to numbers of practitioners and to patients since it saves trouble and is secret. A little syringe is handed to the patient with a bottle of some lotion and directions for use. Under such conditions it would be better to trust to the effects of urination for the washing of the urethra, since a syringe in the hands of the average patient cannot fail to introduce septic matter into the urethra, and easily provokes complications. One may reply that the patient could be taught to boil or sterilise the syringe in some way This would naturally add to his risk of disclosure, and it is questionable then whether in the majority of cases the patient would carry out the directions given him. Allowing, however that a patient can be relied upon to carry out the instructions for sterilisation, it is doubtful if he can be taught the strength of movement which is correct for the injection of fluids into the urethral canal, and there is grave risk of his forcing the solution, with pus, into the posterior urethra, without certain compensating

CHAPTER XIX

LOCAL TREATMENT OF GONORRHŒA

MANY workers would limit the treatment of gonorrhœa to the general measures which have been mentioned in the last chapter but the great majority of those who are in a better position to judge the question consider that local treatment is essential Those who advocate purely general treatment hold that local treatment often results in complications, which do not occur with the purely symptomatic treatment This contention is not substantiated by experience. In fact, patients on symptomatic treatment seem if anything to be more prone to complications than those on a well-directed local and general treatment If however the local treatment is not well directed then undoubtedly it results in a greater number of complications and had better be left alone.

A few facts connected with gonorrhœa may be mentioned here as they form the basis of certain guiding principles which should be observed in carrying out local treatment They are as follows

(1) The inflamed urethral mucous membrane is probably the most sensitive and easily damaged of all. If it is damaged unduly urethritis will certainly become chronic, and the risks of stricture formation are increased.

(2) Gonococci penetrate to the depths of the urethral mucous membrane and into the crypts and follicles which open on it, where they are out of the reach of antiseptics. It is useless to attempt to reach them with strong antiseptics, and mechanical removal with weak antiseptics will suffice for gonococci on the surface.

into the urethra for some distance, it may damage the mucous membrane. A properly shaped nozzle should be capable of entering the meatus for only a millimetre or so at the most, and cannot possibly damage it. Rubber

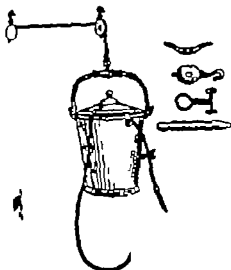


FIG. 65 Enamelled-iron slop-pail arranged as an irrigator

tips of the conical pattern are made for use with syringes and irrigator nozzles which are not of the correct shape

Of the two main varieties of irrigator nozzles, one,



FIG. 66. Anderson double-channelled nozzle.

such as the Janet (fig 65), is provided with a single passage; the other such as the Malocchi and other patterns, is divided longitudinally into two passages, an inlet and an outlet (fig 66).

The difference between them in actual operation will be

forces coming into play which will be mentioned later Finally when all these risks have been run, what is effected? The urethra is not cleansed by such injections as a patient can safely carry out and, in the quantities used, it is doubtful if any lotion with which he could be safely provided would have any great effect on the gonococci in the urethra. If the attempt is made to compensate for lack of bulk by increasing the strength of the antiseptic lotion, the urethral tissues are damaged.

Whether a syringe should be used *by the surgeon* is another matter A large syringe, skilfully used, is doubtless as effective as an irrigator But it is more troublesome and demands greater skill in its use, since an impatient surgeon is apt to employ much more force than is good for the urethra.

The irrigator has the disadvantage that it is more cumbersome and not so easy to sterilise as a syringe. Otherwise it has the advantage of being less troublesome to use, and is much safer in the hands of a patient than a syringe. A patient can be taught to use an irrigator with comparative ease and safety He could never use a large syringe, and, as mentioned, the disadvantages of a small syringe far outweigh its advantages

The appliances for irrigation are very simple. A container for the irrigating fluid is necessary and this can either be a special irrigator supplied for the purpose by the instrument makers, an enamelled iron pail (fig 65) or a quart jug which can be sterilised by pouring some spirit into it so as thoroughly to wet the sides, pouring the spirit back into the bottle, and flaming the remnants left in the jug The solution is syphoned from the jug by means of half inch irrigator tubing, which passes over a bridge at the rim, so as to avoid kinking To the lower end of the irrigator tubing is fitted a nozzle, which should be bluntly conical at the tip Many nozzles are sold in which the tip is cylindrical for about a centimetre from the end, and since a nozzle of this pattern can be pushed

and some of the solution is allowed to flow into the urethra. Before the urethra has become distended the flow is stopped the nozzle removed, and the injected solution is allowed to flow out again. This is repeated two or three times, thus washing the urethra in sections, so to speak, and the



FIG. 67 Irrigation pail, adjustable as to height, devised by Dr Allport and Mr C. H. Mills for use at St. Paul's Hospital.

urethra is then distended with the solution. As soon as it feels comfortably tight, the solution is let out, and the distension repeated two or three times. When it is considered that the anterior urethra has been fairly well cleansed in this manner an effort is made to cause the solution to enter the bladder

For this purpose it is necessary to induce the sphincter

appreciated better by a description of the technique of irrigation first with the single-way Janet nozzle, and then with the double-channelled pattern.

Irrigation.—The patient may lie sit or stand. Patients who irrigate themselves seem to prefer standing though lying or sitting are said to be better for the relaxation of the sphincter

The irrigator is placed at a height of about three and a half feet above the penis It may have to be raised later for irrigation of the posterior urethra, but the height should never exceed five feet since the lower the pressure at which the urethra can comfortably be distended and fluid made to enter the bladder the less the risk of complications

The patient urinates and the glans penis and prepuce are cleansed with an antiseptic, of which probably the most reliable are ordinary spirit and mercury perchloride or biniodide 1/2 000 while potassium permanganate is useless for this purpose.

It is advisable for the patient to wear a mackintosh apron with a hole in it through which the penis is passed if he stands a pail of the pattern illustrated in fig 67 is useful for catching the outflow

The irrigator and tubing are filled with the selected solution at a temperature of 100 F and the operator grasping the nozzle at its junction with the rubber tubing kinks the latter over the base of the nozzle with the tip of his index finger so as to control the flow The clip on the *rubber tubing is then removed or the tap turned, according to the permanent method of control.* The operator grasps the penis, with his left thumb on the dorsum behind the glans and his index and middle finger on the urethra below The index finger helps the thumb in holding the penis, and the middle finger is used to palpate the urethra during the irrigation.

The nozzle is applied to the meatus in such a manner that the flow is directed along and not across, the channel

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to relax It can be *forced* to do so by raising the irrigator to such a height that the pressure of the solution against it compels it to open but this is bad policy *The aim should* be to cheat, or coax it into a state of relaxation, so that the irrigating fluid will enter the bladder freely The nozzle is applied to the meatus and kept there when the urethra feels distended The patient may then complain of some discomfort and should be induced to breathe deeply and told to urinate into the nozzle. For the latter *purpose it may* be well when the sphincter will not relax at the first sitting to instruct the patient not to urinate before the next irrigation Nervous patients may require the instillation of a local anæsthetic such as 5 per cent novocaine, or eucaine, but as a rule, patients soon learn the trick of relaxing the compressor urethræ and to irrigate themselves After allowing a few ounces to enter the bladder the solution is passed out, and the operation repeated twice Subsequently as tolerance is established the amount allowed into the bladder is increased *to as much as half a pint.*

The double-flow nozzle is rather easier for a patient to manipulate but is apt to throttle down the flow of irrigating fluid too severely The nozzle is simply applied to the meatus and the tap turned on The irrigating fluid flows freely in and out of the urethra, which is not particularly distended When it is desired to distend the urethra, a *finger is applied to the outlet of the nozzle* and in this manner the irrigating fluid can be made to enter and leave the urethra in gushes, just as in using the single nozzle. To make the solution enter the bladder a finger is applied to the outlet of the nozzle, and the same devices adopted as mentioned in the case of the Janet nozzle. The usual objection to the double nozzle is that the fluid may enter turn the corner and *leave again without properly* penetrating into the urethral canal, but, as mentioned this is overcome by alternately stopping and starting the outflow with a finger on the outlet.

The question arises, should one irrigate into the bladder regardless of the presence or not of posterior urethritis? Some would confine their attention only to the anterior urethra if there were no evidence of posterior disease, for fear of conveying disease to the posterior urethra. It is by no means certain, however that all danger of conveying infection to the posterior urethra is avoided by limiting the irrigation to the anterior urethra, since some of the discharge may easily be pushed through the sphincter opening On the other hand, a lavage which is obtained by rebound from the face of the sphincter cannot be nearly so effective as that which results from the expulsion of the fluid by a strongly acting bladder the latter acts, moreover in the direction from within out. If, too any infective matter is carried by posterior irrigation into the posterior urethra, it arrives there drowned, so to speak, in an antigonococcal solution, to be swept out again almost immediately The cleansing effect of a forcibly ejected stream must, moreover be greater than that of one due to a rebound from the walls of the urethra and I am convinced that the ideal instrument with which to irrigate the urethra is the bladder Such complications as epididymitis, if caused by posterior irrigation are due to solutions which are too strong or to irrigation at too great a pressure.

The number of irrigations which should be practised daily depends on the stage of the disease. As a general rule, one would say that an irrigation every eight hours during the first week gives better results than one every twelve. Usually however other circumstances intervene which make it impracticable to irrigate more often than every twelve hours. Two irrigations a day should be practised for the first three weeks or month, and they may then be reduced to one daily one every other day and so on, as the discharge diminishes and disappears.

Solutions for Irrigation or Injection.—It is safe to say that there is no substance credited with the slightest anti-

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Then an irrigation every other day may suffice, and if the urine on the day following the rest still remains clear a longer rest may be allowed between irrigations.

Sometimes the discharge does not clear so rapidly or remains persistently muco-purulent. In this case it is well to examine a specimen microscopically to ascertain whether or not there is a mixed infection. If other micro-organisms are found, a few irrigations with one of the mercurial compounds may be tried, such as mercury perchloride 1/?0 000 to 1/10 000 or oxycyanide of mercury 1/4,000 or a mixture of mercury perchloride and potassium permanganate in the usual strength of each. These may be continued daily until the mixed infection has disappeared. No preparation of iodine should be administered to the patient during the period of irrigations with mercurial salts, as they cause the formation of irritating compounds in the urethra.

As mentioned, a change to silver nitrate, 1/10,000 or to protargol, 1/1 000, may be valuable when the urethritis does not seem to be clearing up in the average time, and sometimes the weak picric acid mentioned above, or a combination of the sulphates of copper zinc, and iron, or one of the combinations mentioned in Appendix III, proves a useful change. But the occasions on which it is necessary to forsake permanganate for other remedies are really rare.

Proflavine and, more recently Homoflavine have been tried with promising results. The most suitable strengths appear to be 1/5 000 to 1/3,000 On the whole, the results have been rather better than with permanganate, the discharge clearing up a little more rapidly The effect is not magical, however and the discharge quickly returns if the irrigations are left off too soon after it has ceased. Homoflavine can be dissolved in an alkaline solution.

For routine purposes, then, probably the best local treatment for average cases is by irrigation from the bladder with permanganate of potassium, 1/8,000 to 1/4,000 made slightly alkaline just before use or with Pro- or Homoflavine in strengths of 1/5 000 to 1/3,000

septic or astringent power which has not been used for local application to the urethra. The chief survivors may be divided into (a) preparations of silver (b) permanganates of potassium and zinc, especially the former (c) mercurial solutions (d) Flavine compounds (e) picric acid and (f) some astringent solutions such as the sulphates of iron zinc and copper

The preparations of silver are perhaps more favoured by the German school For irrigation purposes, 1/10 000 silver nitrate or 1/1 000 protargol is often useful as a change when others do not appear to be acting well. The injection of protargol or melargen in a strength of ½ to ½ per cent. with a large syringe is favoured by some, while others use argyrol argentamin or one of the host of other organic preparations of silver none of which has any outstanding advantage over the other In preparing these organic silver solutions, distilled water should be used and the powder sprinkled over the surface. In the declining stages injections of picric acid (½ per cent gradually increased to 2 per cent.) often give good results

For all round work no better results are obtained than with permanganate of potassium Recently on the principle that alkaline solutions are inimical to gonococci, solvent of secretion and soothing I have added sodium carbonate to the permanganate solution just prior to the irrigation

A strength of 1/8 000 permanganate with 0 75 per cent sodium carbonate is sufficient for the first week or two and this can gradually be increased later to 1/4 000 or 1/8 000 permanganate when an astringent effect is desired In most cases of acute gonorrhœa the discharge has become very slight in the morning by the end of the first fortnight If the irrigation is stopped at this stage however the discharge will quickly return Examination of the urine shows by the turbidity of the latter that the catarrh has not ceased and irrigation should continue until after the urine has become clear

tion that, when the discharge has been nothing more than a slight moisture at the meatus in the morning for more than three or four weeks, or heavy purulent threads persist in the urine, which is otherwise clear it is an indication for the institution of treatment which is appropriate to chronic gonorrhœa.

The treatment of chronic gonorrhœa, like that of most chronic inflammations of mucous membranes, is a task requiring considerable patience and fertility of resource. There is no infallible remedy for chronic gonorrhœa. It demands the doing of many little things which vary with individual cases, and it is possible to deal with the subject only by considering the treatment of each of the several conditions which make for chronicity

The first essential is an examination of the urethra and its adnexa, in order to determine in which spots the disease still persists. This has already been dealt with (pp 28–37).

As a routine measure, it is always well to treat any mixed infection which may be found, since mixed infection is more often than is generally considered the sole cause of persistent urethral catarrh.

Should a mixed infection be found, irrigation with a mercurial salt, such as mercury oxycyanide, 1/4 000 or with Homoflavine, 1/8,000 will often be found effectual, especially if it is combined with the use of an autogenous vaccine. The vaccine is best prepared from the urine, whenever this is practicable. It is practicable when there is a laboratory in the town, to which the specimens can be carried by hand the details of collection were described on p. 300 Naturally at the same time as he supplies the vaccine the pathologist will provide valuable information as to the nature of the infecting micro-organisms. Very commonly these are found to be diphtheroid bacilli, streptococci or staphylococci, and safe initial doses of these would be 20 millions staphylococci and 5 millions bacilli or streptococci, according to the case. It is unwise to

In cases of mixed infection it is best to irrigate with oxy cyanide of mercury and on the rare occasions when in purely gonococcal infections *permanganate is not doing* well for the patient, a change over to one of the alternative preparations already mentioned is often valuable.

Although some cases may clear up in as short a time as a week or ten days, this is by no means the rule. The average case of first attack without complications is not fit for suspension of all treatment in less than six weeks, and I always enquire very closely into the standard of cure where the average duration under treatment is much less than this Doubtless, cases can be discharged in less time if one pays no attention to the urine, or the slight watery discharge in the morning so conveniently regarded as post gonorrhœal catarrh.

It may be necessary to suspend irrigations for some days in certain cases The chief occasions which require this are œdema of the prepuce coming on after the irrigation treatment has been instituted acute prostatitis and posterior urethritis of such severity that there is marked tenesmus, with perhaps some blood at the end of the micturition. In these cases, bed and the administration of sedative remedies, such as have been mentioned above under general medical treatment, are indicated the treatment of acute prostatitis will be considered under that of complications. It is generally taught that irrigations should be suspended with the onset of epididymitis, but, after watching the progress of very many patients suffering from epididymitis whose daily irrigations were continued I believe that, when carefully carried out, they are not only not harmful but of value in this complication.

Chronic Gonorrhœa

The dividing line between subacute and chronic gonorrhœa is quite arbitrary and purely a matter of opinion in individual cases. One may say for convenience of descrip-

the following will be in the Charrière scale, thus, 1* F Reference to the table below will enable the reader to translate from one scale to the other

Guyon	12,	18	24	30	36,	42,	48,	54,	60	66,
Charrière	6	9	12,	15	18	21	24	27	30	33.
English	2,	4,	6	8	10	12	14	16,	18,	20

The usual type of gum-elastic bougie is one with an



FIG. 68. Gum-elastic bougie.

olivary tip (fig 68). They are used chiefly for cases in which it is unsafe to employ a metal instrument, such as infiltrates which will not pass a bougie of more than 15 F

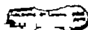



FIG. 69. Clutton sound.




FIG 70 Lister's curved sound.



FIG. 71 Béniqué pattern of sound, with double curve.

For higher numbers than this metal sounds are usually employed.

Metal sounds are of various patterns, curved and straight, samples of which are illustrated in figs. 69–71 As to choice, between those with a plain curve, one would prefer

commence with higher doses, although eventually these are considerably increased

After disposing of the mixed infection, gonococcal foci may persist or these may of course, be solely responsible for the chronic catarrh

In the majority of cases the infection is found persisting in one or a number of follicles and crypts which open on *the mucous membrane*, or in isolated patches where the submucous tissues are infiltrated In the anterior urethra, these will be detected by palpation of the urethra over a straight sound or by the acorn tipped bougie (p 81) If the posterior urethra is infected it is a common event to *find that the prostate* or *seminal vesicles* or both, are involved and the evidence of this will be found by examination per rectum (p 85)

The local treatment of urethral infiltrates consists in the passage of instruments into the urethra which will (1) *massage them* (2) *open the mouths of the follicles* and empty them of infected material and (3) assist in promoting a fresh blood supply and so lead to absorption of new formed connected tissue, which constitutes the main part of the infiltrate Much of all this can be effected by the passage *of solid sounds* or *bougies* and *of mechanical dilators* which can be expanded after introduction.

The sounds or bougies used for treatment of the urethra are gum-elastic, and nickel or silver plated metal. The latter may be curved or straight As their use constitutes an important *part of the treatment of chronic gonorrhœa* it may be well to describe here some of the common patterns and the usual routine of their use.

The size of the bougie is often a matter of confusion, owing to the fact that there are three different scales in common use—*Charrière s*, which mounts by thirds of a millimetre Guyon s which increases by sixths of a millimetre and the English scale, which increases by half millimetres from No 1 which is 1½ millimetres In order to avoid repetition, the sizes of bougies and sounds given in

the following will be in the Charrière scale, thus, 1* F Reference to the table below will enable the reader to translate from one scale to the other

Guyon	12,	18,	24	30	36,	42,	48	54,	60	66.
Charrière	6	9	12,	15,	18,	21	24,	27	30	33.
English	2,	4	6	8,	10	12,	14	16,	18,	20.

The usual type of gum-elastic bougie is one with an



FIG 68. Gum-elastic bougie.

olivary tip (fig 68). They are used chiefly for cases in which it is unsafe to employ a metal instrument, such as infiltrates which will not pass a bougie of more than 15 F



FIG. 69 Clutton's sound.

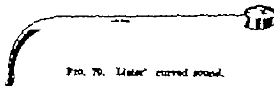


FIG. 70. Lister' curved sound.



FIG 71. Béniqué pattern of sound, with double curve.

For higher numbers than this metal sounds are usually employed.

Metal sounds are of various patterns, curved and straight, samples of which are illustrated in figs 69–71 As to choice, between those with a plain curve, one would prefer

Clutton s, with its shorter beak The Béniqué pattern is preferred by many urologists as it follows more naturally the curves of the urethra Nicoll s, as also Watson s, sounds are narrowed at the part which lies within the meatus, in order that the latter may not impede the movements of the sound in the deeper parts of the urethra Most curved sounds increase from the tip to the widest part by 4 F

Sterilisation —Gum elastic bougies are most easily sterilised by soaking for some minutes in 1/2,000 biniodide or perchloride of mercury

Another plan is to hang them in a tall glass, stoppered cylinder at the bottom of which is a layer of wool soaked in formalin In either case the antiseptic should be removed before the instrument is used by rinsing it in boiled water or in 1/60 carbolic acid Good gum-elastic bougies will stand sterilisation in boiling water and a good plan in this case is to use a Herring s steriliser in which the instruments can be suspended Metal sounds are sterilised by boiling in an ordinary or a Herring s steriliser

Lubricants —Many lubricants are sold in tubes for convenience but may be a source of danger as it is difficult to smear the lubricant over the instrument without using a finger which may not be aseptic. A very simple lubricant is liquid paraffin When a tall cylindrical steriliser such as Herring s is used the paraffin can be floated on the surface of the water in which the instrument is sterilised In this case as the instrument is withdrawn from the steriliser it becomes coated with a layer of paraffin and need not be touched. Another simple lubricant is the following

Pulv Tragacanth	1 5
Cold water	5·0

Rub up to an even mucilage and dd Glycerine to 100 Sterilise in a water bath.

The lubricant can be injected into the canal with a

syringe and thus overcomes the difficulty of coating the instrument.

Anæsthetics.—Of the many effective local anæsthetics, probably novocaine 1 per cent., eucaine lactate 1 per cent., and stovaine are the most useful. The anæsthetic chosen is injected into the urethra to the extent of 10 c.c. and retained for ten minutes. If it is desired also to anæsthetise the posterior urethra, another 10 c.c. is injected at the end of this time, without allowing the first to escape. Or a drachm or two of 5 per cent. may be introduced into the posterior urethra with an Ultzmann's syringe.

It is not advisable to use a local anæsthetic when the urethra is being explored with an acorn-tipped bougie, unless necessary on account of spasm, since the patient's sensations are a valuable guide to the locality of diseased patches. An anæsthetic is never employed for dilatation with a mechanical dilator for the similar reason that the patient's sensations are a useful guide to the permissible extent of the dilatation at any one sitting.

The Passage of Bougies and Sounds.—It is a good general rule not to pass an instrument until the urethritis has settled down to the stage when there is only a minute drop of discharge and the urine is practically clear. To pass an instrument before this is to invite trouble from acute epididymitis. It is a safeguard against this complication, also, to bring the local innervation under the influence of atropine, which can be accomplished by the introduction of a suppository containing gr. 1/70 of the alkaloid the night before, one hour before, and the same evening. This is especially valuable as a preliminary to the passage of an instrument through the posterior urethra.

To avoid carrying bacteria from the meatus and fossa into the deeper parts of the urethra and the bladder the patient should invariably urinate before the instrument is passed, and some boric acid lotion or a solution of mercury oxycyanide, 1/4 000 should be introduced into the bladder. Permanganate should not be used for this precautionary

irrigation as it makes the passage of an instrument difficult if not impossible

All instruments which are passed into the *posterior* urethra should be warmed to the temperature of the body as cold instruments are very apt to induce a spasm of the sphincter which no persuasion will overcome

The patient should lie on a table of convenient height.

If the meatus is particularly narrow great saving of time and discomfort to the patient is effected by performing a preliminary *meatotomy* This trivial operation is most easily performed by means of a meatotome, which is a narrow knife enclosed in a sheath, from which it can be made to project by pressure of a lever After anæsthetising the mucous membrane as described above, the instrument is passed in such a manner that the blade will project in the middle line below It is passed just beyond the neck of the fossa navicularis, *i e* for about three centimetres, the lever is pressed and the instrument withdrawn with the knife exposed cutting the neck of the fossa and the mouth of the meatus in the middle line as it leaves The only precautions required are to cut in the middle ventral line and not to make the blade protrude more than is necessary to enlarge the meatus to the required extent The wound may be packed with adrenalin if it bleeds too freely but generally a piece of gauze smeared with an antiseptic ointment is all that is required. The wound should be kept open by daily packing and has generally healed in about a week, when the dilatation can be commenced.

Straight Sounds.—The passage of a straight sound requires *no special description.* It is assisted past the neck of the fossa by rotation and this point being passed it usually falls by its own weight to the bulb The first number used corresponds to that of the acorn tipped bougie which will pass comfortably along the canal, and this size is succeeded by the one next larger No force should ever be used and practically no bleeding should follow the operation.

While the instrument is in position, the outside of the urethra should be massaged over it this assists in breaking up the submucous infiltrates.

The Passage of Flexible Bougies into the Posterior Urethra.—Gum-elastic bougies sometimes catch at the sphincter or before this, in a fold of the urethra. Injection of the lubricant into the urethra beforehand will often prevent this, and it is well to pull the penis up over the bougie as it passes through the anterior urethra, keeping it on the stretch until the end of the bougie has passed the sphincter opening When the bougie has reached the bulb and has come to a stop, penis and bougie should be moved as one into the horizontal position by the two hands working in unison, and if the patient will then only breathe quietly the instrument usually slips into the posterior urethra easily enough. If this fails, it is a good plan to take out the bougie, bend it, about a quarter of an inch from the end, to a right angle with the rest, and then to pass it with the tip towards the roof of the urethra. In cases of tight stricture a whip bougie is often useful the fine end of the bougie engages the opening, which is further dilated by the tapering portion and stem of the instrument

To pass a Curved Metal Sound.—The operator stands on the right of the patient, grasps the penis with the left hand, and draws it over the line of the right groin. The instrument is inserted with its concavity towards the roof of the urethra, and it is passed along the urethra, keeping the tip as closely in contact with the roof as possible, until the sphincter is reached, when the penis and instrument are carried across, until they are almost lying on the middle line of the body The right hand holds the sound just firmly enough to keep it in position, and the left draws the penis as much along the instrument as possible, while bringing it into the vertical position. This usually suffices to cause the tip to enter the membranous urethra, and the instrument is then brought down gently to the

horizontal position while it glides without being forced, into the bladder. During this manœuvre it is a good plan to press the tissues over the pubis in the direction of the patient's feet, in order to relax the suspensory ligament. It is rarely that a general anæsthetic is required for the passage of a metal sound, but occasionally when local anæsthesia has failed, the instrument glides in with the greatest ease as soon as the patient is under a general anæsthetic.

Ordinarily the passage of a sound can be effected twice a week but if any operation is followed by bleeding or by rigor and rise of temperature, an interval of at least a week should be allowed before the next attempt. The first sound passed at each subsequent sitting is the highest number used at the last, and this is followed by the next two higher numbers. It is a mistake in the waning stages of gonorrhœa to attempt rapid dilatation by the passage of a number of increasing bougies at one sitting. It merely leads to the production of linear fissures in the urethra and prolongs the disease. After reaching 24 F it is better to proceed with mechanical dilators.

Mechanical dilators were introduced on account of the fact that an instrument which will enter the meatus will not dilate every portion of the urethral mucous membrane. Their principle is that they can be passed into the urethra closed and while the rigid stem lies within the meatus and fossa, the rest of the instrument can be expanded by turning a screw handle. They may be divided into straight and curved patterns, the former for the anterior urethra, and the latter for the posterior. In some patterns of the latter the dilatable portion is only that which lies in the posterior urethra, while in others the straight and the curved portions are both dilatable, these being intended for dilatation of both anterior and posterior urethra at the same time. In still another pattern of straight dilator only that portion which lies within the bulb is dilatable.

The best dilators are Kollmann's flushing They have the advantage that, during the dilatation, a stream of warm boric lotion can be mad to flow from behind forwards, washing away plugs of secretion from the mouths of the opened follicles and assisting considerably the opening-up effect of the dilatation. Perhaps the most useful selection of three flushing dilators is one straight, dilatable along its whole length one straight, dilatable only along a portion of its length, for use on the bulbous portion; and one curved, dilatable only up to the portion which lies within the posterior urethra. A dilator which aims at dilatation of both anterior and posterior urethra at the same time is an instrument which must be used with considerable care, or the sphincter will be stretched so much by it that the patient may suffer from incontinence of urine for some days afterwards. In fact it is difficult to see how one could use such an instrument to secure its full effect without this accident happening

All these instruments require some care for their preservation, since their numerous joints and passages may become rusted up Probably the simplest method of preserving them in good order is as follows. After use, the instrument is wiped dry with a cloth, and some spirit is syringed along the flushing channel. The instrument is then put into a tall bottle containing a mixture of one part cresol, or lysol, and nine parts of alcohol. Before use the instrument is thoroughly rinsed in boiling water to remove the preservative, and some of the flushing liquid is run through it to remove the preservative from the flushing channels.

The Passage and Use of Mechanical Dilators.—Although very useful instruments, mechanical dilators may do damage unless used with discretion. No anæsthetic should be used in the urethra, and careful attention should always be paid to the patient's sensations. The dilator is passed and connected by its inlet with an irrigator containing warm boric lotion, which is hung above the patient, while

horizontal position while it glides without being forced, into the bladder During this manœuvre it is a good plan to press the tissues over the pubis in the direction of the patient's feet, in order to relax the suspensory ligament. It is rarely that a general anæsthetic is required for the passage of a metal sound, but occasionally when local anæsthesia has failed, the instrument glides in with the greatest ease as soon as the patient is under a general anæsthetic.

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millimetres of mercury) is applied to the urethra, as read off on the manometer and, by closing a tap, this is maintained for fifteen minutes at each sitting The mercury

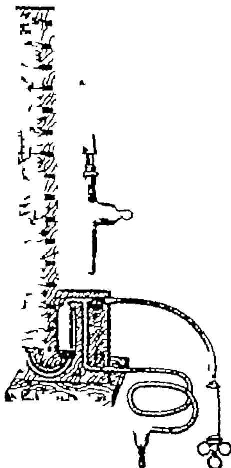


FIG 72 Campbell bougie with manometer. A, Spiral bougie with conical tip B Cone to plug meatus; C Glass trap to catch any urine separated from bladder

manometer illustrated has the disadvantage of being rather cumbrous, and a clock pattern is more convenient.

the outlet is connected to a rubber tube which carries the flushing solution into a bucket.

The handle is turned *till the indicator stands* opposite the number which represents the size of acorn-tipped bougie which the patient can comfortably take, or until the patient complains of the urethra feeling rather stretched. It is a good plan then to hand the instrument over to the patient, instructing him to turn very gingerly after five to ten minutes from the first feeling of stretching It is not advisable to screw up more than one number *on the* dial after the patient first commences to feel the stretching sensation, and any sign of bleeding is a signal for stopping the operation. When the higher numbers are reached, the increase should be by half numbers at each sitting If no bleeding occurs, the dilatation may take place once or twice a week but hæmorrhage during or after the sitting is always a sign for a fairly long rest of say ten days or a fortnight. There is no doubt that the flow of warm lotion over the mucous membrane assists in softening the stretching infiltrates and prevents linear fissures. The bulbous portion can be stretched gradually up to 45 F and the penile to 35 F

Suction Apparatus.—Of other methods of emptying follicles, two forms of suction apparatus may be mentioned. One of these, Cambell's bougie (fig 72) is in the form of a spiral spring to one end of which is fixed a small conical tip and to the other a metal tube. Over the latter slides a conical metal piece to which a piece of pressure tubing is attached. The bougie is passed into the urethra with the help of an introducer which fits into a hole in the base of the conical tip The introducer is withdrawn and the conical piece slid over *the metal tube, which now occupies* the meatus its purpose is to plug the meatus. The piece of pressure tubing is then attached to the conical piece by one end and by the other to the side-arm of a manometer which is also connected to a hand-suction pump By working the pump a suitable negative pressure (350

especially when associated with hard infiltrates in the urethra. This form of treatment was tested on a considerable scale at Rochester Row Portobello, and No. 9 Stationary Hospital for the treatment of acute gonorrhœa, having previously given good results in the hands of Valentine in India, of Fulton in U.S.A., and of Kobelt in Germany the results eventually proved disappointing in our hands, and the treatment was dropped so far as acute gonorrhœa was concerned.

In chronic gonorrhœa, however it is worthy of more attention than it receives at present. There are three

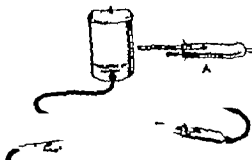


FIG 74 Valentine water-heated bougie with tank, thermometer etc. A, Glass window for observation of temperature of water

patterns of heated bougie. One, the Valentin (fig 74), is a hollow metal curved bougie for application to anterior and posterior urethra. To its inlet tube is connected a rubber tube leading from a small tank containing water at a certain temperature. A rubber tube is connected to the outlet tube of the bougie to lead away the water to a bucket The temperature is recorded by interposing between the bougie and the cistern a glass chamber into which a thermometer is thrust The chamber is a glass syringe barrel closed at one end with a rubber bung the water enters at one end through the nozzle of the syringe and leaves for the bougie at the other by a tube through the bung.

Mills has applied the same idea in another form. His negative pressure catheter (fig 73) as it is called, is a framework of four arms which hold the walls of the urethra apart while suction is applied. It is made in three sizes two anterior and one posterior The latter is fitted with a rubber flange at its vesical end, so that suction can be applied to the whole length of the urethra without extracting bladder contents It is intended for use with a rubber suction ball, but can also be connected up to a

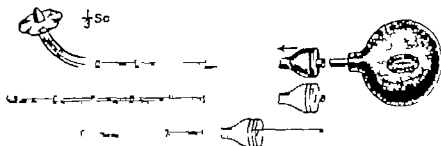


FIG 73. Mills s negative catheters, with suction ball. The conical piece lose to the rubber ball is t plug the meatus.

pump and manometer the advantage of which is that it is under better control

The suction treatment is applied once or twice a week. There is no doubt that suction bougies are very useful for cases in which there is obviously retention of secretion within follicles The effect on these can be seen by urethroscopy after the sitting and can be appreciated by watching the rapid reduction of any periurethral infiltrates which may be felt from outside. Although like every other known treatment, it is not a cure for every case of chronic gonorrhoea I have seen many long standing cases clear up wonderfully quickly under Captain Cambell after a few treatments with his bougie, and Dr Allport has reported equally good results from the use of Mills s instrument at Rochester Row

The application of HEAT to the urethra is often of considerable value in the treatment of chronic urethritis,

the patient as follows. On the night before and the same morning an atropine suppository is inserted into the rectum. Before the massage the patient should be irrigated with boric acid lotion or oxycyanide of mercury solution 1/4 000 and some of the lotion left in the bladder

The proper instrument for massage of the prostate is a finger Mechanical instruments have been invented for the purpose but should be avoided; the operation is something more than a senseless squeezing of the gland, such as a mechanical instrument can only perform.

The patient can adopt the knee-elbow position on a table, or having removed his trousers, stand with his left foot on a rung or the seat of a chair over which he leans as far as possible, whilst grasping the back of the chair The surgeon inserts his gloved, right forefinger into the rectum and presses with his left hand above the pubes, so as to approximate it as far as possible to the right forefinger The latter is passed to the upper margin of the prostate and, sweeping outwards, lightly feels for each seminal vesicle in turn. If either of the latter is palpable, starting from the fundus at the outer end, the finger presses the contents from without inwards and downwards, finishing up in the middle line of the prostate. Having thus dealt with the seminal vesicles, the prostate is massaged for about two minutes. The finger should travel with gentle pressure over the surface of the prostate from the margin to the centre, stopping to press into and empty the boggy spots in passing Lastly it is carried once or twice down the middle line. The tendency is to confine the massage almost entirely to the middle line and to be too energetic about it. One cannot indicate the number of ounces pressure required, but if the surgeon will err rather on the side of gentleness and will watch the result in the shape of prostatic secretion which appears at the meatus, or in the solution passed out of the bladder immediately afterwards, he will soon realise that it does not really require a great amount of pressure to empty a prostate

The lubricated bougie is passed and the water turned on at a temperature of about 100 F By coiling the rubber tubing leading from the water cistern to the thermometer chamber in a basin containing hot water the temperature of the water circulating in the bougie is gradually raised to about 114 F and maintained at this for about fifteen minutes

A straight metal bougie (fig 75) has lately been made for me by the Holborn Co for application to the anterior urethra It works on the same principle. Kobelt's electrically heated bougie is a more convenient instrument than these. It is a gum-elastic bougie containing an electric resistance, the two ends of which project from the base of the bougie to take a suitable connection. This is connected in turn to a transformer or an accumulator

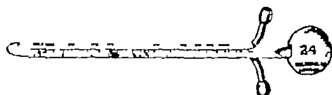


Fig 75. Straight water heated bougie.

An arrangement for recording the temperature is also attached As a rule, the treatment is applied twice a week in sittings of twenty minutes each.

Treatment of the Prostate and Seminal Vesicles.—Another main cause of chronicity in gonorrhoea is infection of the prostate and seminal vesicles with which the above instruments can hardly deal and the simplest method of treating these organs is by regular massage.

Massage of the prostate and seminal vesicles is an operation of considerable value when carried out with discretion, but apt to result in such complications as epididymitis when carried out too early or too energetically Except as shown below for treatment of the declining stages of prostatic abscess, one would not institute prostatic massage before the end of the fifth week. It is a good plan to prepare

the patient as follows. On the night before and the same morning an atropine suppository is inserted into the rectum. Before the massage the patient should be irrigated with boric acid lotion or oxycyanide of mercury solution 1/4 000 and some of the lotion left in the bladder

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Doubtless, much of the effect of prostatic massage results from the muscular contraction which it stimulates

The operation may be repeated twice a week. More often than this is inadvisable. It is a good plan to record the progress of the prostate to normal size and consistency on a small diagram on the case-card

Injections and instillations of various agents are often used as adjuvants to the above-mentioned forms of treatment. With regard to injections it may be said at once that there are few occasions when it is necessary to employ any astringent other than permanganate of potassium, the strength of which can be increased if necessary to 1/3 000 or 1/2 000 Of the others, perhaps the combination of zinc and copper sulphates of each gr ½ to one ounce, silver nitrate 1/10 000 and protargol ¼ to ½ per cent. are the least harmful and one should err rather on the side of over-dilution. I am sure that much harm has been done by the strong solutions which have often been injected into the urethra by way of stirring matters up The injection of a strong solution of silver nitrate, which gives the patient considerable pain, is followed by a profuse purulent discharge for a few days, after which the discharge may cease for a time. But the result is often bad A considerable amount of new formed connective tissue is built up in the submucous strata as a result of such a violent inflammation, and it becomes next to impossible to restore the urethra to a normal state The above is written from experience of a fairly large number of cases who have suffered these injections some years previously Doubtless a number of them are down in the books of the surgeons concerned as cures, because the discharge did cease for a short time afterwards. When it returned, however the patient simply dared not suffer a repetition of the treatment and applied elsewhere

Instillations consist in the application of such solutions as 1–5 per cent silver nitrate to selected spots in the deep urethra by means of a Guyon s or an Ultzmann syringe

The end of the catheter is passed down to the selected spot and a few drops of the solution injected. Naturally the surgeon is working in the dark and does not know for certain that the solution is really applied just to the diseased spot. In any case, some of the strong solution is certain to diffuse over the healthy mucous membrane, damaging it considerably

Altogether therefore, one would say that strong injections and instillations are likely eventually to do more harm than good, and are better left alone. This does not apply to applications through a urethroscope, which are under better control.

Vaccines have already been mentioned in the treatment of gonorrhœa, and it need only be said that they are useful adjuvants to the treatment of chronic as of acute gonorrhœa. In chronic cases it is usually found that the dosage can be pushed to a much greater height than in acute cases.

Should the above measures fail after a patient trial, the treatment will probably have to be carried out through a urethroscope. There is no question as to the value of the urethroscope in the treatment of chronic gonorrhœa, and those who are familiar with its use will doubtless cure their cases more rapidly than those who have to rely only on the measures already described. But urethroscopy requires considerable practice before it can be used to advantage and the reader who is sufficiently interested in it to acquire the necessary instruments and spend the necessary amount of time over its study would not be content with such an abbreviated description as is possible in this book. The science and art of urethroscopy must therefore be omitted.

As a general rule, it is advisable to interrupt the local treatment of chronic gonorrhœa every two months if the gleet and other signs continue. Better progress follows a rest of about three months than when the treatment is more or less continuous.

It is important always to keep the patient's mind from

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In any case, a stricture is likely to form unless dilatation is applied.

Cowperitis requires rest in bed and frequent sitz baths which are made as hot as the patient can tolerate. The bowels should be kept open, so that defæcation is easy by enemata of olive oil or the administration of paraffin. Sometimes the abscess resolves or discharges along the gland duct into the urethra. *More often it points and* bursts in the perineum. The abscess may be aspirated and injected, and this, no doubt, assists eventual healing even when an opening has to be made at a later date. In cases of cowperitis it is always well to investigate the anterior urethra for stricture, and full dilatation secured before the patient is dismissed.

Prostatic Abscess.—Probably the most arresting symptom about this complication is retention of urine. Before resorting to a catheter an attempt should be made to secure relief by means of a hot sitz bath, which has the added virtue of assisting to relieve pain. An anæsthetic such as novocaine, cocaine, or stovaine should also be injected in order to relieve the spasm of the compressor urethræ When a catheter has to be passed, a soft rubber one should be chosen. The sitz baths should be repeated frequently and the patient brought under the influence of atropine by the insertion of a suppository containing $\frac{1}{60}$ gram night and morning. Defæcation should be made easy by the same measures as in cowperitis.

After the abscess has burst, as it usually does, into the urethra, resolution may be assisted by the use of ichthyol in the form of a suppository as follows

℞

Ichthyol	gr ii
Ext. Opii	gr. ¼
Ext. Belladonnæ	gr ¼
Butyr. Cacao ad	gr xv
Fiat Suppos.	i

Sig.—One suppository to be used night and morning.

the continuous contemplation of his genitals These patients are very apt to become experts on urine threads, and too, their first business in the morning is anxiously to examine their meatus after squeezing the urethra from behind forwards A little prostatic fluid or any glandular secretion appearing at the orifice, weighs on their minds all day and the resulting depression is very detrimental to recovery They should be forbidden these melancholy joys, and not the least important part of the treatment is that which is designed to maintain the general health in the fittest condition possible by regular exercise, fresh air and so on.

Complications of Gonorrhœa

Peri-urethral abscesses usually require no interference from without but sometimes reach a very large size point, and burst outside. They may be laid open, packed and allowed to heal from the bottom or they may be aspirated and injected before bursting My own preference is for aspiration and injection. As soon as it is certain that the infiltrate has softened in the centre, a fairly stout, hollow needle, attached to an all-glass, or a record syringe is run into the middle of the abscess cavity and its contents aspirated. When it has been comfortably emptied, one of the following may be injected tincture of iodine diluted with water to 1 in 20 collosol argentum or electrargol. This should be aspirated once from the cavity and some of the solution finally left inside. The aspiration generally has to be repeated on the following day and perhaps on the day after that. When the abscess has subsided whether it has been treated from outside or not, regular dilatation should be instituted, and this can be combined with the suction treatment described above. If the urethra is not treated in this manner remnants of infective material left in the abscess may burst at a later date into the urethral canal and reinfect it

needle is a sharp one and the testicle is gently handled. Generally very little fluid is obtained but the relief from pain is usually very rapid. Schindler recommends that after puncturing in the middle line each side should be punctured in turn before withdrawing the needle. After the puncture the patient should spend as many hours as possible soaking his scrotum in water which is as hot as he can tolerate. The simplest plan of doing this is to place a quart basin full of boiling water on a form, and the patient, sitting astride the form, holds his scrotum up over the water until this is cool enough to allow of its immersion. Meantime, of course, he has been steaming his scrotum. As soon as the water has cooled down, it is renewed. The administration of vaccine is useful here, as in other gonococcal complications.

When the pain and swelling have subsided sufficiently to allow of the testicle being handled fairly freely strapping it assists in resolution. Strapping is carried out as follows (1) The scrotal tissues are relaxed by immersion in warm water (2) The skin is thoroughly dried, and the testicle isolated and forced against the lower wall of the scrotum by the thumb and index finger encircling the scrotum above the testicle, where a constricted neck is formed cutting off the diverticulum containing the testicle from the rest of the scrotum. This neck is encircled with two turns of adhesive plaster ½ in. wide, so as to keep the testicle imprisoned in the scrotal diverticulum. Using the encircling plaster as the starting and ending point, similar or rather narrower strips are laid on from back to front, so that each successive strip slightly overlaps its predecessor until the whole testicle has been covered. A long narrow strip of plaster is then wound spirally around the whole strapped area, so as to hold it well together. The secrets of obtaining a neat result are to press the testicle well down into its corner and to apply the first strip of encircling plaster in such a manner as to make the neck as narrow as possible and prevent the testicle escaping into the rest

There is always a great risk of the opening becoming stopped up after the abscess has discharged for a few days, and steps should be taken to avoid this by instituting very gentle massage as soon as the pain has been relieved by the first discharge of pus. The massage must naturally be very gentle at first but may be strengthened slightly on succeeding days if care is taken not to hurt the patient. Neglect of the precaution to keep the abscess open up to the end frequently results in the patient having to undergo a repetition of all the symptoms which he suffered in the first instance retention of urine, intense pain, strangury etc.

The treatment of chronic prostatitis has already been described in connection with that of chronic gonorrhœa (p. 320).

Epididymitis requires rest in bed, opening of the bowels with a suitable laxative, and milk diet. The testicle should be supported and one of the best methods of doing this is to fit a suspensory bandage of the pattern described on p. 201. This allows the patient to lie in any position, and does not confine him to his back like the platform laid across the thighs which appears to be so popular. As to local treatment, the application of lead and opium lotion, glycerine of belladonna, or collodion of belladonna is popular as it gives no trouble to the attendant, but I believe the following to be the best routine for these cases.

The epididymis is punctured with a moderately stout needle (say an intramuscular needle) attached to an all glass or a record, syringe, and an attempt made to draw out some of the effusion. The operation is a very simple one. After sterilising the scrotal skin with iodine, the testicle is very gently brought up so that the epididymis presses firmly against the scrotum, bulging it outwards, in fact. The needle is run in along the epididymis in a direction from the globus minor towards the major—i.e. from above downwards, seeing that the testicle is being held upside-down. The operation does not require a general anæsthetic, and causes practically no pain if the

needle is a sharp one and the testicle is gently handled. Generally very little fluid is obtained but the relief from pain is usually very rapid. Schindler recommends that after puncturing in the middle line each side should be punctured in turn before withdrawing the needle. After the puncture the patient should spend as many hours as possible soaking his scrotum in water which is as hot as he can tolerate. The simplest plan of doing this is to place a quart basin full of boiling water on a form, and the patient sitting astride the form, holds his scrotum up over the water until this is cool enough to allow of its immersion. Meantime, of course he has been steaming his scrotum. As soon as the water has cooled down, it is renewed. The administration of vaccine is useful here, as in other gonococcal complications.

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of the scrotal cavity If this is done properly the rest is simply a matter of laying on strips of plaster at leisure. If the encircling plaster is not firm enough the testicle will slide back into the general scrotal cavity and the result will be very disappointing The great disadvantage of strapping is that sooner or later the skin becomes abraded. This can be avoided by covering the area with strips of lint on the same principle as the strapping before the latter is applied.

Arthritis—If the joint is acutely inflamed and distended, aspiration with a stout needle attached to a good syringe is a most valuable means of relieving pain and assisting recovery It is a trivial operation. It goes without saying that precautions must be taken to prevent the entry of septic organisms into the joint, but this is a simple matter since the joint is not to be laid open to the atmosphere. If the skin is wiped over with ether and then alcohol, and finally painted with iodine in chloroform (1 in 15) one can carry out the operation as safely in a bell tent as in an operating theatre.

In addition, during the acute stage, rest is very important, and this may be obtained with a splint in combination with mild extension. The latter will often relieve pain which has been very acute while the joint has been rested only by the patient remaining in bed. It is most important however to institute massage and passive movements as soon as the acute symptoms have subsided

As to general measures, it has been noted by many observers that patients suffering from arthritis frequently improve after the injection of some substance which causes a severe general reaction The nature of the remedy injected does not appear to matter so long as it is safe and causes a rise of temperature I have found great benefit from the intravenous injection of antityphoid vaccine, as suggested by Auld A dose of 150 millions, contained in 1 c.c. is injected intravenously and repeated or increased to 250 millions in three or four days.

Gonococcal vaccines are probably of more value in the acute form of arthritis under discussion than in the more chronic form to be mentioned presently

Ionisation with salicylate for relief of pain, and hypodermic injections of collosol argentum, ʒss–ʒi, two or three times a week, have proved valuable.

In the more chronic form of arthritis, collosol argentum injections and the free use of iodides internally with ionisation, radiant heat, massage, and passive movements are indicated.

In the treatment of any form of arthritis which depends on urethritis, nothing is more important than an investigation of the urethral condition. In the great majority of these cases the prostate, or seminal vesicles, or both, are diseased, and improvement commences only when attention is directed to the thorough treatment of these parts. If either is found to be distended, or tender or both, it should be emptied regularly by massage, and an opportunity should be taken of obtaining a culture for vaccine purposes from the urine after the massage has been performed. The technique of this has already been described (p. 300). There are grounds for believing that prostatic massage also has the effect of inoculation with an autogenous vaccine.

Iritis and metastatic conjunctivitis are generally combined, and their treatment may be considered together The first essential is complete rest for the eye, and instillation of atropine is essential for this purpose, as well as for the prevention of adhesions. The eye should also be shaded. Bathing the eye with boric lotion as hot as the patient can stand it and hot applications to the temple are valuable.

Attention to the urethral condition is of prime importance, and until matters are set right there the patient will always be liable to relapse.

Of other general measures, the intravenous injection of 50–100 c.c. of collosol iodine has proved very valuable at

Rochester Row The injection can be repeated in a few days if necessary

Gonorrhœal ophthalmia demands prompt attention, at whatever inconvenience to the medical attendant It is one of those conditions in which to-morrow will not do so well as to-night. To-morrow the cornea may have commenced to ulcerate and the eye be in a hopeless condition. The following routine will generally avail to save the eye if it has not gone too far already

(1) Protect the other eye with a *watch-glass*, fastened on with strips of plaster (2) Wash out the affected eye very thoroughly with boric acid lotion, or with physiological salt solution. This is done, naturally after wiping the pus from the outside. (3) Instil a few drops of cocaine and atropine solution (1 per cent. of each) (4) Paint both lids inside with silver nitrate, 10 gr to the ounce, or with 20 per cent. argyrol. The latter must be freshly prepared by sprinkling the powder on the surface of cold distilled water (5) Smear the lid margins with an antiseptic ointment, such as boric or yellow oxide of mercury (6) Apply a pad of cotton wool, and fasten it to nose and forehead with plaster so that it rests lightly on the eye. (7) Give a dose of gonococcal vaccine say five millions (8) Repeat the cleansing of the conjunctival sac with boric lotion every hour (9) Repeat the instillation with atropine and cocaine, and the silver nitrate painting of the lids every twelve hours. (10) Repeat the vaccine in about three days, increasing the dose.

This may sound a very troublesome and elaborate treatment, but, after all, it would be much more troublesome for the patient to have to do without one or both of his eyes for the remainder of his life. Actually it requires the constant attention of someone who can be relied upon to carry out the simple directions required. Directions should be in writing and the best plan before leaving is personally to rig up about a foot above the bed head, a small irrigator (a jug will serve) from which the solution

can be syphoned or drained. The tubing leading away the lotion should be provided with a simple ratchet clip and the nozzle at the lower end of it should be of glass. Between irrigations this nozzle should rest in an antiseptic, such as biniodide or perchloride of mercury lotion.

Few things are more important than precision as to the directions, and I have seen more than one eye fall a victim to vague instructions or worse, to that incompatible mixture of medicine and so-called morality which relegates a gonococcal affection associated with a urethral discharge to the category of ailments for which the patient should be thankful to receive any treatment.

Gonorrhœa in Women

The treatment of gonorrhœa in women consists in the application of the principles already laid down to the several parts of the female genitals which may be affected. Each of these must be systematically examined and dealt with, and it is quite useless to prescribe a vaginal douche with a few vague directions as to its use.

General Measures.—During the acute stage, if the discharge is profuse, rest in bed for a few days is indicated. To ensure cleanliness, which is of great importance, the patient should take frequent hot sitz baths, or douche the parts well with hot water over a bidet with a central spray.

For the application of local treatment by the medical attendant the dorsal position should be adopted, as for uterine examination. The labia are separated and the parts thoroughly cleaned with an antiseptic, such as biniodide of mercury on a swab before any attempt is made to deal with the parts in detail. The urethra and the neighbourhood of its opening are then examined for signs of disease, the urethral contents being exposed by pressure through the vaginal roof.

Urethritis is treated with irrigations, or large syringe injections, using an acorn-tipped nozzle by which the flow

Rochester Row The injection can be repeated in a few days if necessary

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Some liquid culture of the lactic acid bacillus is mixed to a dough with sugar of milk, and short rods of the mass punched out. These are allowed to dry under aseptic conditions and are used as pessaries. Fresh pessaries are prepared every few days, because the lactic acid bacillus loses its activity in the dried form after this time.

The treatment is repeated every twelve hours for three or four days, after which the vagina is daily swabbed out with lactic acid ½–1 per cent., continuing the lactic culture pessaries as before. The principle of the treatment is to maintain, by the action of the lactic acid, the normal acidity of the vaginal contents which is inimical to gonococci.

It is usually necessary to apply local treatment to the cervical canal. In doing so, care should be taken not to pass beyond the internal cervix, unless there is evidence of trouble higher up. After purifying the vagina by swabbing as above, the cervix is swabbed out with protargol solution, and it may be necessary to divide the external os to assist in the drainage of the cervical canal.

Endometritis and metritis demand expectant treatment in the acute and subacute stages—rest in bed, regulation of the bowels and the measures which have been mentioned above in connection with the urethra and vagina. When the disease has become chronic it may be permissible to attempt local treatment, and of all those which have been advocated from time to time, probably dilatation of the cervix followed by swabbing of the interior of the uterus with some silver preparation, such as protargol, is the safest and most effectual. Intra uterine douching may easily lead to further complications, unless a free return of th solution is insured.

Salpingitis is treated in the acute stage on the expectant principle, unless it is clear from the acuteness of the general symptoms that operative interference is necessary

The systematic use of vaccines has been found by many workers to be a valuable accessory to other forms of treat

is directed backwards This is introduced just within the meatus and the solution turned on. The nozzle is gently pushed along the urethra, which it irrigates in a direction from behind forwards, until the bladder is reached. Some ounces of the irrigating fluid are introduced into the bladder this is passed and the operation repeated twice. The best solutions for irrigation are permanganate of potassium 1/8 000 to 1/4 000 or one of the silver preparations such as 1/1 000 protargol. If the treatment is confined to injection of the urethral canal the strength of protargol may be greater (½–2 per cent) according to the acuteness of the process.

It is necessary to examine closely the numerous gland orifices around the mouth of the meatus and to deal with these in detail. Reddened spots should be examined, and an attempt made to squeeze pus from them Any follicles found diseased may be dealt with by injecting them with silver nitrate or protargol, with the help of a fine, blunt pointed hypodermic needle or they may be destroyed by the insertion of a galvano-cautery point and turning on the current

Bartholinitis requires incision of the affected gland and packing with gauze.

Vaginitis is usually the least important part of gonorrhœa in women and can be dealt with by permanganate douching followed by the insertion of tampons impregnated with iodoform or with 10 per cent ichthyol in glycerine.

Watson advocates, above all, the introduction of lactic acid cultures into the vagina, and his routine treatment may be summarised shortly thus After a long sitz bath containing a spoonful of kerol the vagina is swabbed with 1/2 000 biniodide or preferably with 1/200 lactic acid B P If the former is used, all traces of it must be removed before the next step After careful drying there is inserted a pessary made up of a liquid culture of a lactic acid bacillus with sugar of milk. The pessaries are made as follows

out on much the same general principles as that of gonorrhœa in the adult. It is a very persistent complaint and one which is difficult to treat on account of the smallness of the parts. Indiscriminate vaginal irrigations may lead to infection of the uterus, and it is better to treat with daily dressings and lavage of the external genitals. After removal of the pus by swabbing a tampon soaked in [illegible] per cent. protargol should be placed between the labia to insure separation of the parts. The tampon should be changed about every six hours.

Rectal Gonorrhœa

Gonorrhœal proctitis calls for regular irrigation with permanganate of potassium, or one of the silver preparations already mentioned. At a later stage local treatment through a speculum may be advantageous for the purpose of making applications to spots where the disease still persists. The size of the parts makes this not such a difficult operation as urethroscopy

ment especially in salpingitis They must be used with careful regard to the reaction which they may provoke and always on the principle of commencing cautiously Bruck recommended that the vaccine (arthigon) be injected intravenously but no better results have been obtained in other hands by this than by the ordinary subcutaneous method

VULVO-VAGINITIS OF LITTLE GIRLS

As mentioned this is apt to be a pest of institutions, but its prophylaxis and treatment require mention in this book since it may be introduced into a private household by infection of a mother or nurse.

Prophylaxis—This has been partly mentioned in dealing with gonorrhœa of women A patient suffering from gonorrhœa who has to do with the bathing and general management of little children should always be warned of the danger of the infection being transmitted to them. She should be instructed carefully never to neglect the thorough cleansing of her hands after treating her own person, as well as before attending to children Naturally towels used by the adult should on no account be used for children and it is a good plan to make a rule never to use a towel which is not bone-dry Drying is as effective an agent as any other against the gonococcus and simpler to apply in a small private household. Apparently gonococci will remain viable and virulent in bath water for twenty four hours, so that tubbing is not without danger in a household where one member is suffering from gonorrhœa. It is better to avoid immersion, but to take water from the tap or from a small basin which has been scalded out with boiling water or wiped out with 1/500 biniodide in spirit. Children in such a household should not share towels, since one may start the disease and infect others before the fact of the first having become infected is apparent.

The treatment of vulvo-vaginitis of little girls is carried

the secretion from the warts, or these may grow again there.

Of the numerous methods which I have seen employed perhaps that used by Mr C H Mills at Rochester Row has proved the most successful. The principle is to keep the growths as dry as possible. They are painted frequently with the following solution

℞.
Liq Arsenicalis
Vin. Ipecac.
Sp Vin. rect.

The arsenic has a deterrent effect on the innumerable spirochætes found in the secretion from the warts, and the spirit serves to dehydrate the growths which quickly wither up. Pedunculated growths may be ligatured off

Soft Chancre.—When the chancroid is hidden beneath a tight prepuce it should be exposed and this may be done by circumcision or by dorsal incision. At first sight it may appear simpler to carry out the circumcision at once, since a dorsal incision leaves one with the necessity of carrying out the circumcision at a later date. Having seen hundreds of cases treated by both methods, I am sure that it saves time in the end to perform the dorsal incision first. It seems to be next to impossible to prevent contamination of the wound surfaces when circumcision is performed before a chancroid has healed, and if all the redundant tissue has been removed a broad, ugly granulating surface is left, which is very slow in healing and produces eventually anything but an elegant result. As a compromise, a fairly broad V may be taken out of the dorsum of the prepuce, and on healing, it may be found that the patient requires no further operation, the remains of the prepuce having shrunk to fairly elegant shape and proportions. Either operation can be carried out easily under local anæsthesia. A syringe is filled with 2 per cent. eucaine solution and armed with a long sharp narrow needle. The latter is run into the cutis vera at a point opposite the

CHAPTER XX

BALANITIS PAPILLOMATA AND SOFT CHANCRE

Balanitis.—The treatment of simple balanitis is not usually a matter of any great difficulty As soon as it is ascertained that there is no sore of deeper moment there syringing out the preputial sac with peroxide of hydrogen, followed by the injection of 1/1 000 biniodide of mercury solution usually suffices It may be necessary in certain cases to slit up the prepuce by a dorsal incision to insure better drainage but as a general rule a few injections as described suffice to clear up the inflammatory condition, and the patient can then be circumcised to prevent a recurrence

Papillomata, or condylomata acuminata, are often troublesome lesions to treat Watson recommends the application of a wet dressing of lactic acid. Isolated warts may be snipped off and the base touched with the pure acid In other cases a continuous wet dressing of ½–1 per cent. lactic acid is applied in such a manner as to bring the acid into as intimate a contact with the growths as possible, the lint being packed between the individual masses. Every few days the bases of the growths may be touched with the pure acid

Sometimes shaving the mass of growths off serves to effect a rapid cure but this is a bloody operation and generally disappointing as new warts quickly grow on the raw surface If the warts are situated at the end of a long prepuce this may be removed by circumcision but care should be taken not to contaminate the wound edges with

sulphur treatment is the fact that it does not interfere with the finding of spirochætes if perchance the sore should later take on syphilitic characteristics. Further pain is quickly removed and suppurating adenitis prevented.

Phagedena always calls for prompt treatment. If there is the least suspicion that this condition is present, no time whatever should be lost before exposing the sore and dealing with it. In a comparatively few hours such severe damage may have been done as to cause the medical attendant severe twinges of conscience, if he has put off the energetic treatment to a more convenient moment.

After exposure of the sore the problem is to stop the extension of the process. The application of strong acids such as fuming nitric acid, is commonly advocated, but I have not yet seen a sore in which long immersion in a bath of eusol, with wet dressings of the same between baths, has failed rapidly to stop the spread of the gangrene. Mills, here also, prefers the free application of sulphur which has not yet disappointed him. Quite possibly the sulphur combines with the toxins and side-tracks them, as it does not seem to have a strongly antiseptic action.

When the sore has become clean and granulating, the process of epithelialisation may be hastened by the application of 1 or 2 per cent. scarlet red ointment.

Buboes.—Suppuration of the inguinal glands is a common cause of invalidism, which may last for months. Very often the sore has been quite a trivial one, and has long since healed when the suppurating bubo appears.

The common treatment of a bubo is to incise it and pack with gauze. The result frequently is that the groin takes many weeks or even months to heal, and, from a long experience of these cases, I am convinced that incision is not the quickest method of getting the patient back to work. The groin area is probably one of the most septic in the body and it is next to impossible to prevent secondary infection. The result then is that the weakened

centre of the corona, and a drop of the solution is injected so as to produce a wheal. The needle is pushed in the cutis along the mid-dorsal line of the prepuce, successive drops being injected so as to produce a series of overlapping wheals the whole length of the proposed incision. A ligature may be applied to the base of the penis as a means of retaining the solution longer *in situ* but this is hardly necessary if the wheals are carefully produced. After about ten minutes the skin can be slit up leaving the mucous membrane exposed. This is then similarly infiltrated and slit up

The bleeding is stopped by pressure, and attention then turned to the soft chancre. If a V incision is chosen, the infiltration naturally follows the two limbs of the proposed V

Numerous applications have been employed for the treatment of chancroids of which the following may be mentioned. Three-hourly dressings with 25 per cent. copper sulphate for the first twenty four hours, followed by the regular and thorough packing of every crevice of the sore with a strong suspension of iodoform. This is rather a troublesome treatment to carry out, especially if the patient is not to proclaim by the smell that he is suffering from some disease.

Wet dressings of eusol or with 2 per cent. chloramine T are generally more efficacious than iodoform, and it is better if the patient can spend some hours in each day with the penis in a bath of either of these solutions.

Mr C H Mills has had great success at Rochester Row from the application of sublimed sulphur The patient is provided with a supply of this and told to rub it into the sore with the tip of a finger as if he were salting beef. The aim is not to allow the sulphur to become sodden, but to keep on renewing it. A great deal of the success of this form of treatment depends on the patient's attention to detail. If he does not rub in the sulphur well and frequently the result is indifferent A great virtue of the

CHAPTER XXI

THE TREATMENT OF SYPHILIS

BEFORE dealing with the treatment of syphilis in detail, it may be well to make a few remarks on its pathology in order that the principles on which the treatment should be carried out may be better understood.

Although the incubation period of syphilis lasts for an average of twenty five days, histological examination shows that long before this time changes have taken place in the local tissues. In fact, a very few hours after it has entered, the spirochæta pallida has spread widely into the tissues, out of reach of any agent which may be applied to the abrasion by which it entered. It is important, therefore, that any steps which may be taken to abort the infection by local treatment (p. 416) be taken promptly or they will not avail. Further as already shown repeatedly above the developed syphilitic lesion is usually surrounded by a considerable zone of infiltration, through which the body fluids must percolate with difficulty. It is a characteristic of the Sp. pallida that it tends to infect particularly perivascular lymph spaces and to cause thrombosis of the affected vessels. The practical importance of these facts is that as the infection matures, the spirochæte becomes less and less accessible to antispirochætal agencies circulating in the blood. Very early in the disease the spirochæte, in the majority of cases, has invaded the meninges, and here, also, it appears to be less accessible to remedies. It becomes still less accessible, and the resulting disease correspondingly

tissues have not one but many varieties of bacteria to contend with, and there is little wonder that the infection spreads deeper fresh glands become infected, and the ulcer drags its weary way to eventual healing with a weak scar

The following method of treatment, if carried out properly reduces the chances of secondary infection to a minimum and provided that the bubo can be treated early enough results in recovery in far less time than under open incision. The patient is made to rest in bed, and as soon as it is certain that the bubo has broken down, its contents are aspirated For this purpose the area is painted with iodine and the needle usually supplied with a 10 c.c. syringe run into the centre of the abscess cavity in a direction which is almost parallel to the groin. The skin is punctured where it appears healthy if a red, thin, and shiny part is selected the bubo contents will leak through the puncture after the needle has been removed. The contents of the abscess are aspirated until the cavity is practically empty The sterile syringe is then filled with a 1 in 20 solution of tincture of iodine, or with electrargol or collosol argentum and its contents injected into the cavity This in turn is aspirated, and the operation repeated injecting this time 1–2 c.c. of the solution. The puncture hole is sealed up with collodion a pad applied to the groin, and the patient sent to bed. The bubo is emptied again when it refills, and it is probable that the operation will have to be repeated on the following day but after the second day it is possible to lengthen the intervals Even when the patient appears with the bubo so far advanced that the skin over it has become thin, red and shiny I believe that aspiration is the best treatment to adopt at first, since if a larger opening has to be made at a later date, the wound heals much quicker than if such an opening is made at first.

amongst the general population goes up remarkably. Probably also, every syphilologist could relate numbers of instances of severe late syphilides dating from injury or overwork of some part of the body.

The bearing of the above facts on treatment is this: that it must (1) commence as early as possible, (2) be prolonged in, one might say, geometrical proportion to the length of time which has elapsed from the onset of the disease to the commencement of treatment, and (3) terminate only on satisfaction by the most exacting tests that the disease is cured.

Before dealing in detail with the treatment of syphilis, it may be well to devote some space to a consideration of the agencies at our disposal for the purpose, their nature, administration, therapeutic power, and the avoidance of any toxic effects to which they may give rise.

The remedies in common use for the treatment of syphilis are arsenical, antimonial, silver, mercurial, and iodine compounds. In addition to these may be mentioned a sulphur compound, intramine, and an iron one, ferrivine, since they have been so extensively advertised for the treatment of syphilis. Neither of them, however, was found at Rochester Row to have any effect on the spirochaeta pallida or on syphilitic lesions, and they are not recommended for the serious treatment of syphilis.

The Arsenical Compounds

In 1909 Ehrlich, after numbers of experiments with arsenical preparations, which need not be detailed here, produced one which seemed at first to be likely to fulfil his ideal of a *therapia sterilisans magna*. Though it has not done so, it has proved, in the judgment of the very great majority of syphilologists, to be an enormous advance in the therapy of syphilis. This was dioxydiamide-arsenobenzol-dihydrochloride, "606," or the Ehrlich-Hata remedy which, late in 1910, was put on the market as salvarsan. It is a yellow powder which contains about 31 per cent.

more intractable when it has penetrated into the parenchyma of the central nervous system.

After the disease has progressed for some time unchecked or inefficiently checked the spirochæte seems to become so well established that only very prolonged treatment can insure its destruction. It is very probable that the tissues usually establish for themselves an ascendancy over the spirochæte also that after the symptoms of the first generalisation have died down, *the spirochætes do* not disappear from the affected sites, but remain dormant *in situ* Subsequently any agency which lowers the vitality of the tissues at any part of the body allows the spirochætes there an opportunity of gaining the upper hand and the result is a syphilitic manifestation at that *part, which corresponds in character to the age of the* infection.

Lastly it is important to remember a fact which is often forgotten, that absence of naked-eye signs does not prove absence of syphilis Lesions of the skin and mucous membranes and those of the central nervous system which are accompanied by symptoms are not the only manifestations of syphilis The spirochæte has a predilection for perivascular lymph spaces for example, and disease of arteries is not the least important of the evils to which syphilis may give rise, though it is one which may be symptomless for a very long time. The facts just mentioned have this bearing that a positive Wassermann reaction is not a matter of no moment even though the physician with his imperfect diagnostic armamentarium may be able to detect no naked-eye evidence of syphilis A patient suffering from uncured syphilis, however quiet the latter may appear may be likened to a machine with a flaw in its *construction able to work under normal* conditions liable to break down more readily than the flawless machine under abnormal stress The evidence of this is seen in the fact that in times of stress and strain the incidence of severe late syphilitic manifestations

cylinder into which the water is poured the "606" floated on it, the stopper inserted, and the mixture well shaken.

(3) When the solution is quite complete and not before, add sodium hydrate solution until the precipitate which first forms redissolves and a perfectly clear solution is left. Add one-fourth more alkali than was required to produce the clear solution.

(4) Make up with the saline, (b) above, to such a strength that each 0 1 grm. of the remedy is contained in 25–30 c.c. of the finished solution.

(5) Strain through six layers of gauze, or through filter paper

(6) Administer intravenously without delay

A few remarks are necessary in extension of the above directions.

Before opening the ampoule of "606 it is wise to examine it carefully to see that there is no flaw in it. There may be a small crack at the broad end or a small hole at the point where the ampoule, is sealed. If there is doubt about the integrity of the ampoule it should be totally immersed in alcohol, which will trickle through any flaw and wet the "606."

The water should be freshly distilled from a good still, since it is generally agreed that, if stale distilled water is used for the preparation of the solutions, the injection is apt to be followed by much more severe reaction. There is, in fact, good ground for believing that impure distilled water and water in which bacteria have grown since its preparation, increase the toxicity of "606" Ordinary tap-water also increases the toxicity of "606" but a method of preparing tap-water for the purpose is described below which has been thoroughly tested at Rochester Row and found to give as good results as distilled water

Solution of the 606" should be quite complete before the alkali is added. Otherwise the undissolved particles will be converted to white flakes or lumps by the alkali Some workers assist solution by shaking up with glass

of arsenic and on account of its liability to form a poisonous compound on exposure to air is kept sealed up in ampoules containing a neutral gas, such as nitrogen. A chemically equivalent compound produced in France soon after the appearance of salyarsan is known as arsenobenzol (Billon) ; similar compounds made in this country since the commencement of the war are known as kharsivan and arsenobillon respectively and a Canadian product is know as diarsenol. As mentioned all of them are chemically equivalent and so far as can be ascertained, of equal therapeutic power For this reason they will be referred to below as 606

This compound forms an acid solution when dissolved in water It was at first injected intramuscularly or subcutaneously but gave rise to such severe local pain that the local injection was almost universally abandoned and the usual method of administering it at the present moment is intravenously Some workers have advocated the administration of 606 in the form of suppositories or as enemata, but this is a method which is not recommended since it appears to have little or no influence in causing the disappearance of spirochætes.

For intravenous administration, it is necessary after dissolving it in water to convert the 606 to the sodium compound by the addition of alkali

The following will be found to be as safe a method of preparation as any —

(1) Prepare the following solutions

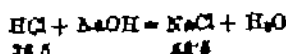
(a) Freshly distilled water
(b) Solution of sodium chloride in freshly distilled water 0 5 per cent
(c) Solution of sodium hydrate, 4 per cent

Sterilise all three by autoclaving or steaming

(2) Dissolve the dose of 606 in distilled water at the rate of 10 c c. for each 0 1 grm. of the remedy Solution is best effected in a tall, stoppered, graduated glass

Even though the finished solution appears to be quite clear it will be found that, when strained or filtered, the proportion of patients who suffer from reaction after the injection will be less than when this step is omitted.

The necessity of employing freshly distilled water has debarred many from using "006" in spite of the fact that many firms of chemists can be relied upon to produce water which is above suspicion. The following simple method of preparing solutions from tap-water will be found to overcome this difficulty. It is a modification of Taege's method and depends on the chemical equation



$$\underset{36.5}{HCl} + NaOH = \underset{58.5}{NaCl} + H_2O$$

Since 36.5 parts of pure HCl produce on neutralisation 58.5 parts of NaCl, it is easy to calculate the amount of HCl which it is necessary to add to the water to produce eventually the required concentration of saline. The "006" is dissolved in the acid solution, and the neutralisation of this and of the added acid is performed in one operation.

The heavy earths and metals are precipitated out of the tap-water as insoluble hydroxides thus: A few drops of a 1 per cent. alcoholic solution of phenolphthalein are added to the necessary amount of water, say 2 litres, in a flask, and sodium hydrate solution of any strength which is convenient (4 per cent.) is added until the formation of a pink colour indicates slight excess of alkali over that required to precipitate the impurities. The water is then boiled for a few minutes and filtered through non-absorbent cotton wool and filter paper arranged in a glass funnel, the filter paper being next the funnel and a mass of cotton wool laid on it. The filter is supposed to remove the pink colour but, as a matter of fact, the filtrate is still slightly pink. From this purified tap-water two solutions are prepared:

Solution A, in which the "006" is primarily dissolved.

leads but these are not necessary and they have the disadvantage that they become coated at first with a gelatinous film of undissolved 606 the disappearance of which is difficult to see This film floats out as white flakes if it is still present when the alkali is added.

Most makers advise the addition of just sufficient alkali to clear the solution. Milian, however pointed out that the just-clear solution is a mixture of the mono- and di-sodium compounds of 606 which is more toxic than the pure di-sodium compound resulting from the addition of rather more alkali than is usually recommended. The makers of arsenobenzol and of arsenobillon acting on this, mark on their ampoules the amount of sodium hydrate which it is necessary to add to obtain the di-sodium compound. As a matter of clinical experience, I believe that, when a slight excess of alkali is added the injection is followed by less reaction. It is most convenient to add the solution from a burette.

The strength of sodium hydrate solution which is used for the alkalisation is not a matter of any very great moment within limits. My own preference is for 4 per cent because it is easier to gauge the end point than when the 15 per cent. recommended by the makers of salvarsan is used The makers of arsenobenzol recommend 4 per cent.

Although certain workers have found that 606 can be administered with safety in solutions as concentrated as 1 per cent. and believe that it is more active in this form, it will usually be found safer to give it in a strength which is not greater than 0 4 per cent. If given stronger than this, it must be injected much more slowly otherwise a higher proportion of patients will suffer from vasomotor symptoms, to be discussed below

The saline employed at first was of a strength of 0·85 to 0·9 per cent., but since Marschalkó pointed out that this resulted in a hypertonic solution, which may be responsible for reactions after the injection, it has become the common practice to use a saline of 0 5 to 0 6 per cent.

the operator's ideas of convenience. They may be divided into two main varieties—those in which the solution is injected, and those in which it is allowed to flow by gravity into the vein. Of the former may be mentioned the apparatus originally recommended by Schreiber which is similar to that shown in fig 76 and that suggested by Iverson, as well as Bogrow and favoured by McIntosh and Fildes, which is somewhat similar to that shown in fig 77

With the Schreiber apparatus, the solution is alternately

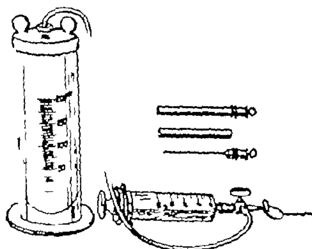


FIG 76.

drawn from a cylinder and injected into the vein, the three-way tap of the syringe being turned as required to direct the flow in the right direction. The syringe is first filled with saline, which is injected in order to be certain that the needle is really within the vein. If this is not the case, a swelling is seen to form over or about the vein, and the matter is rectified without the patient having to suffer the pain and swelling which would result from the injection of "606" solution into the subcutaneous tissues. When it is clear that the vein has been punctured successfully the rubber tube connected with the syringe is transferred

To 990 c.c of the water are added 10 c.c of a one in three dilution of dilute hydrochloric acid (B P) The 606 dissolves very easily in this solution, and neutralisation of 0 6 grm. eventually requires about 0 5 c.c. more 4 per cent. soda solution than when the ordinary method is employed.

Solution B —For dilution of the alkalised 606," and for general use as ' saline.

Add 10 c c. strong hydrochloric acid (B P) to about half a litre of the purified tap-water Add sodium hydrate solution of any convenient strength (say 64 per cent.) until the pink colour just returns Make up to a litre with the purified tap water

Knowing that strong hydrochloric acid (B.P) contains 31 8 per cent. of pure HCl a calculation based on the above equation will show that the neutralisation of 10 c.c. of it with soda will result in just over 5 grm. NaCl, and since this is contained in a litre, the required strength of saline has been produced. The final product has a slightly pink tint, owing to its alkalinity and the presence of the phenolphthalein. The detailed steps for preparation of say 0 6 grm. 606 when using the modified Taege s method are as follows

Pour 50 c.c. of Solution A into a tall, *glass-stoppered*, mixing cylinder which is graduated, and dissolve in it 0 6 grm. of 606 When the solution is quite complete, and *not before, add, from a burette*, 4 *per cent.* sodium hydrate solution until the precipitate which first forms disappears, and a clear solution is left. The amount of *soda solution* which *is required* if the above directions are followed is usually about 4·7 c.c. Add 1·0 c.c. more alkali after the solution is cleared. The solution of alkalised 606 is then diluted to the required strength with Solution B

THE INTRAVENOUS ADMINISTRATION OF 606

Apparatus.—The apparatus required for the intravenous administration of 606 varies in character according to

solution poured into the funnel. After the needle has been inserted into the vein and the solution has flowed until it is again about to disappear down the tubing more saline is poured into the funnel in order to sweep the remainder of the "606" out of the tubing and to wash the vein walls. Usually from 10 to 20 c.c. saline is allowed to flow after the last window in the tubing has lost its yellow tint. If the needle is withdrawn too early before some saline is run through it, there is more likelihood of thrombosis occurring. If the operator is skilled and wishes to save time, it is a good plan before inserting the needle to allow saline to flow until the bottom window just begins to acquire a yellow tint indicating the arrival of the "606" at that point. This leaves a few cubic centimetres of saline to act as "pilot," and still insures that the needle is not covered with "606" solution at the moment of its insertion.

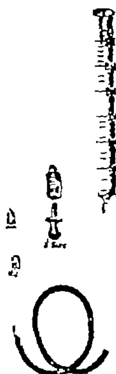


FIG. 78. Single funnel arrangement for infusion of 606. Shows also needle and connection in detail.

In order to overcome certain inconveniences connected with the single-funnel apparatus, such as the necessity of standing ready to pour saline into the funnel at the critical moment when the "606" is about to disappear down the tube, the double arrangement shown in fig. 79 has been devised. It is on the same principle as the single apparatus, but the main portion of the saline is contained in a separate funnel. Before the "606" is poured into its proper funnel—L in the illustration—the whole system is filled with saline by

to the cylinder of "606" solution, and this is injected. As soon as the dose has been administered a syringeful of saline is injected to wash the vein wall free of "606". In the case of the apparatus shown in fig 77 the solution is forced into the vein by increasing the pressure of the air above it

Of the gravity or infusion apparatus, that illustrated in fig 78 is the simplest, a funnel from which a piece of

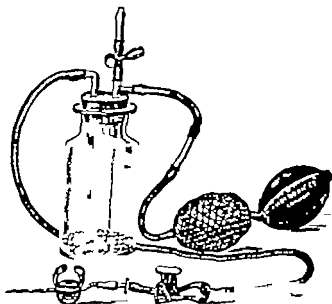


FIG 77

rubber tubing depends which is suitably interrupted by glass windows At the end of the rubber tubing is a connection for attachment of the needle. The funnel is first filled with saline to the height of a few inches from the bottom and air removed from the tubing by this device the needle-connection end of the tubing is held as high above the level of the saline in the funnel as possible the clip is opened and the tubing lowered until a steady flow of saline appears at the outlet. The saline is allowed to flow out of the funnel until its level stands at the bottom of the funnel, when the flow is stopped and "606"

close to the bend of the elbow but on occasion operators have to use other veins, such as one at the back of the hand or the wrist. If the vein has been injected previously it is a wise precaution to palpate it in order to see that it is not thrombosed. The vein is made prominent by fastening a rubber band, or the device shown in fig 80 round the limb on the proximal side of the proposed site of the puncture, in such a manner as to retard the venous, but not the arterial flow this is supplemented by making the patient clench and unclench his fist a few times, leaving it clenched. Slapping the arm with the palm of a hand or with a towel, or steeping it in hot water are devices adopted at various times to assist distension of the vein. If the vein does not stand out prominently it can generally be felt, unless the patient is too stout, or both stout and muscular In the latter event, it is usually better to make the patient open his hand, since the rigidly contracted muscle behind the vein prevents the latter from being detected by palpation.


FIG. 80. Armlet for conveniently distending and releasing distal veins when the operator is working alone.

A needle with a short point is used, since if the point is long it is apt to damage the vein wall more easily and may moreover lie partly in and partly outside the vein, allowing some of the solution to trickle into the surrounding tissues. The edges of the bevel at the needle-point should be slightly concave. Some makers produce needles which are ground quite flat here, and they are very trying instruments, as the point of such a needle will not pick up the vein wall. The needle-point should be inspected to see that it is not turned, and it is well to keep an arkansas stone, on the curved back of which the needle can be sharpened when necessary

pouring this into one of the funnels and, having opened the clips 1 and 2 allowing it to find its way *via* the Y piece into the other. The air is then removed precisely as described in the case of the single apparatus. The saline is then made to flow out of the funnel L (by raising it above the other) until the level stands just at the top of the tube leading out of it when the clip 2 is closed. The 606 solution is now poured into the funnel L. After inserting the needle into the vein and opening the tap T behind the needle, the level of the saline in the funnel R is watched to ascertain that the flow is satisfactory. The saline is then cut off by closing clip 1 and the 606 turned on, by opening clip 2. Finally when the required dose has run off the clip 2 is closed and clip 1 opened to allow saline to sweep the 606 out of the tubing from the Y piece to the needle.

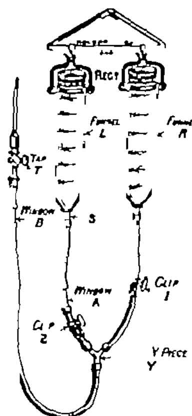


Fig 79. Double-funnel arrangement for infusion of "606. Illustrates also a convenient tap on the needle connection.

The apparatus is a very convenient one for institutional work since it requires very little attention after the needle has been inserted. A number of sets can be suspended from a horizontal bar and one operator with three or four attendants, can comfortably manage four sets at one time.

A few hints on the technique of vein puncture may be useful. The vein selected is usually in front of the forearm,

connection made in such a manner as not to disturb the needle-point.

When the needle has entered the vein, the necessary tap or clip is opened, and the site watched for swelling which would indicate that the needle-point had become dislocated. If the latter happened with an infusion apparatus which was not more than three feet above the patient's arm, the flow of saline would quickly stop. After the flow has been established, it may stop or become extremely slow. This is usually due to one of four causes. (a) The needle-opening may be pressing against the vein wall: this is rectified by moving the needle slightly or rotating it. If this manœuvre does not re-establish the flow the solution should be cut off, the tubing disconnected from the needle, and the tourniquet reapplied. If no blood appears, the needle is either (b) dislocated, (c) blocked with clot, or (d) in the case of a very small vein, this has thrombosed. In the former event (b) the needle can usually be brought back again into the vein by moving it intelligently until blood flows. This failing another site must be chosen.

It is often taught that the sign of a dislocated needle is the appearance of a swelling over the vein. This generally does happen but if the needle-point is in the tissues on the deep side of the vein, no swelling may appear. The few really bad arms resulting from misplaced 006 % solution which I have seen, have been in cases where the operator relying only on this sign of swelling which did not appear assisted the flow by raising the funnel, or pumping harder according to the nature of the apparatus in use. The patient generally feels a burning pain at the site of the injection if the solution is running outside the vein. He may however think that this is usual and say nothing about it, unless asked.

With a solution of a strength of 0·3 per cent. to 0·4 per cent., a rate of 30–40 c.c. per minute (say four minutes for the administration of 0·3 grm. in 90 c.c. with attendant

A very common cause of failure is neglect by the operator to fix the skin over the vein so that skin and vein are, as it were one. The forefinger of the operator's left hand should be laid firmly *on the skin below the site of the puncture*, and far enough away from it not to force the operator to plunge the needle into the vein at too great an angle. It is an advantage to take a long hold of the needle (behind the tap in the arrangement shown in fig 70) as too short a hold blunts the sense of touch.

The needle is introduced along the direction of the vein being held at a very slight angle to the plane of the skin and with its eye looking upwards The skin may be punctured directly over the vein, or slightly to one side of its crown. The tendency at this point is to gaze vaguely over the site of the puncture instead of concentrating as closely as possible on it and picturing by *every sense possible the position of the needle until the latter has entered the vein* this is a very common cause of failure. Another common tendency is to jab the needle through the skin, jab at the vein and to end up somewhere with the needle buried up to its hilt A deliberate puncture, with a strength of movement which is just sufficient to carry the needle-point through the skin, the faintest possible pause to gauge the position of the point with relation to the vein, and then a similar onward push to carry the point, with *a few millimetres of the stem, into the* vein are usually most successful. If the operator watches the site of the puncture, he will usually see a sign which is of great value. Before the needle enters the vein, while *it is pressing back the anterior* wall of the latter a little dimple appears in the skin over the needle-point. When the latter enters the vein the dimple flattens out. If the operator is uncertain of having entered the vein, he can verify the fact by disconnecting the needle, when successful puncture will be demonstrated by a flow of blood from the needle. On remaking the connection the needle should be grasped firmly and the

therapeutic effect. Another advantage of the slower absorption is that the immediate effect on the patient is less violent, and side-effects are not nearly so common after intramuscular or subcutaneous injection of "914" as after intravenous injection of either "914" or of "606."

The chief disadvantage of the local injection of "914" is the pain which may result, but, with a little care over the technique, this can largely be overcome. The following techniques may be mentioned.

Subcutaneous Injection.—This is the method preferred by Wechselmann, and by Major C. F. White, R.A.M.C., who has made several thousand injections by it. The aim is to place the solution on the top of the fascia covering the glutei. To do so the skin and subcutaneous tissue over the upper and outer quadrant of the gluteal region are pulled away from the underlying muscle with fingers and thumb of the left hand, forming thus a kind of cone or pyramid of tissue. Into the base of this the needle a fairly stout one, is run so as to land its point under the apex. The needle-point should then be lying on the fascia, which can be verified by moving the point of the needle from side to side so as to make it scrape on the harsh fascia. If uncertain that the point of the needle is placed correctly a good plan is to withdraw it slightly and run it in again in such a manner that it is bound to perforate the fascia at a slope. Then the needle is withdrawn, while, as it were, levering the point outwards. As the point leaves the fascia again a characteristic click is felt. The dose can be dissolved, in the syringe itself, in about ten minims of distilled water

At Rochester Row the intramuscular method is still preferred, though it has the disadvantage that it may lead to some stiffness of the injected muscle after a few days.

Intramuscular Injection of "914."—After trying various combinations, including glucose and stovaine, novocaine

saline) is usually well borne. If the solution is more concentrated or if the patient had *previously shown signs of* vaso-motor disturbance, to be discussed later it should be given much more slowly

NEO SALVARSAN AND CHEMICALLY EQUIVALENT PRODUCTS

The difficulties connected with the preparation of "606 for injection led Ehrlich to modify it with a view to obtaining a preparation which was more convenient. The *result was Neo-salvarsan or 914 a condensation product* of formaldehyde-sulphoxylate of soda with di-oxydiamido-arseno-benzol. Chemically equivalent products now available are Novarsenobenzol (Billon) Novarsenobillon, Neo-diarsenol, and Neokharsivan All of these will be referred to below as 914

It is a yellow powder containing 20 per cent. of arsenic *and very soluble in water in which it forms a neutral* solution. It is much more liable than 606 to become toxic on exposure to air so that, after dissolving it, there should be no delay over its injection. For purposes of dosage, 0·9 grm. 914 equals 0·6 grm. of 606.

The Administration of 914."—The objections to the subcutaneous or intramuscular method which were mentioned above in connection with 606 do not apply in nearly the same degree to 914 Even when injected in simple solution it does not cause nearly the same amount of pain as *606 and absorption from the site of injection* is much more rapid than after a similar injection of 606 Absorption is not so rapid as after the intravenous injection, and this may account for the fact that it has been found to be therapeutically a more effective method of administering the newer arsenical preparations than the intravenous injection of 606 A study of the literature shows that methods of administration which result in rather slower excretion of the remedy have a better

large ball of cotton wool, sewn up in lint, and repeat the massage daily for three days.

At the present moment this technique has succeeded in very largely abolishing the immediate pain, and the great majority of patients make no complaint whatever. Three or four days later, however, a local reaction commences which makes the gluteal region stiff and rather tender for a few days. Patients of sedentary habit seem to suffer more, since soldiers on full training duties do not ask for "Excused duty" or "Light duty." Patients vary greatly with regard to local reaction and pain, and it is difficult to convey by description an accurate impression of it. The practice at Rochester Row is to give seven injections at weekly intervals, and it is rarely that the course has to be interrupted on account of local reaction, while in some cases 13 or 14 injections have been given without interruption. The method is not yet perfect, but the encouragement to persevere with its improvement lies in the fact that, while it is not followed by any vaso-motor disturbance and the technique is so simple that it can be practised anywhere, the therapeutic results are better than those which follow the intravenous method.

The Intravenous Injection of "914."—When first introduced, "914" was dissolved for intravenous injection in about 100 c.c. distilled water or 0.4 per cent. saline, at room temperature, and given in much the same manner as "606" is now injected; the concentrated solution is now employed almost universally. Either boiled tap-water or distilled water may be used, and the solution may be as concentrated as 0.9 grm. in * c.c. water.

It has the advantages of simplicity and probably greater safety, since a shorter time intervenes between the opening of the ampoule and the injection of the remedy, while the latter is brought less into contact with such disturbing elements as water impurities.

The technique of administration of concentrated solutions is simple. The dose may be dissolved in the syringe

solution and solution in human serum as well as emulsification of the solution with a creocamph. cream base injection of the remedy simply dissolved in water has been found to give the best results

Technique —(1) Take a - c.c. record syringe and cap the nozzle with the base of a hollow needle the base of which has been made up with sealing wax.

(2) Pour 10 minims of distilled water into the syringe and dissolve the 914 in it with the help of a glass rod. In doing so hold the syringe vertically and pour the powder into the water in such a manner that as little as possible touches the sides

(3) Refit the piston to the base of the syringe turn the latter nozzle upwards and push the piston into the syringe barrel

(4) An area which is 2 in square and has its postero-inferior angle 2 in posterior to the tip of the great trochanter is a suitable one in which to place the injection Find a spot in this area where no pain is caused by sharply depressing the tissues with the point of a finger pushed against the skin as if to strike the iliac bone Here insert the needle (1¾ in long and 50 gauge) at right angles to the plane of the skin pushing it in almost to its base if the point touches bone withdraw about two millimetres.

(5) See that no blood is oozing from the needle base.

(6) Holding the needle, in order that the position of its point may not be disturbed fit the syringe to it and inject *slowly* If the patient complains of pain running down the leg withdraw the needle and select another site.

(7) Before removal, rotate the needle once or twice on its long axis, and as it is being withdrawn pinch up the skin and subcutaneous tissue around the needle

(8) Hold the skin and subcutaneous tissues thus for a few seconds after the needle has been withdrawn.

(9) Give a hypodermic injection of morphia gr ⅙ to ¼

(10) Massage the site of the 914 injection with a

(figs. 81 and 82) In the days of purely mercurial treatment clinical relapses were so frequent while the patient was actually undergoing injections, that the weekly examination of syphilis patients in the Army was an arduous duty It was necessary for the safety of the patient's comrades that any suffering from open lesions should be brought back into hospital without delay and the examination had to



FIG. 81. Case of severe tertiary ulceration after seven months of careful mercurial and iodide treatment.

be very thorough, lest any such cases be missed. Under present-day methods, I have never seen a patient relapse during a course of treatment, and it has become unnecessary to search every nook and cranny for lesions. The practical difference which "606" and mercurial treatment has made is illustrated, also, by the following facts.

Under systematic mercurial treatment, 83 per cent. of

itself or in a small gallipot. It is wise to fit a short pointed needle to the syringe, for the same reasons as were mentioned in the case of 606 A good syringe for the purpose is a record in which the nozzle is arranged close to the periphery of the metal end piece (not centrally as in the ordinary type of syringe) this arrangement brings the needle more into line with one side of the barrel. When the needle has entered the vein, blood is seen to flow back into the syringe, especially if the piston of the latter is gently pulled upon. The injection can usually be completed in one minute from commencing to press the piston home, but in some cases it may be advisable to inject much more slowly as in the case of 606

THE THERAPEUTIC EFFECTS OF 606 AND OF 914"

The immediate effect of either of these remedies is to cause the rapid disappearance of the spirochætes from syphilitic lesions so much so that it is rare to find spirochætes in syphilitic lesions in which they abounded previously twenty four hours after an injection of 0 3 grm. 606 or of 0 45 grm. 914 This effect is considerably more rapid than that of mercury where spirochætes may be found as long as ten days after commencing treatment. The clinical effect is also more rapid than that of mercury and in the experience of most syphilologists who have used these remedies there must be numbers of instances where the institution of treatment with 606 or 914 produced rapid recovery after mercury had failed. Instances of this kind were, naturally more common in the earlier days just after the introduction of 606 treatment, and there was no wonder that the effect of these remedies was then described as magical. As an example, I have seen a patient with forty ulcers on his face and body who had been literally rotting from syphilis under treatment with mercury and iodides for months previously practically healed in three weeks from the first injection of 606

gave a positive reaction to the original test. In comparison with this, Gennerich found in 162 similar i.e. primary and secondary cases, who were treated for less than six months with salvarsan and mercury and observed from one to two years afterwards, that 151 remained com-



Fig. 63. Nodular cutaneous syphilide of ulcerative type.

pletely negative to all tests, including examination of the cerebro-spinal fluid after provocative injections. Of the remaining eleven, four had become re-infected, three had relapsed clinically, two had given a positive Wassermann reaction, and two had remained negative to all ordinary tests, but had shown slight changes in the cerebro-spinal fluid after provocative injections.

soldiers suffering from syphilis required readmission to hospital at least once during the first year for reappearance of contagious lesions In contrast with this the readmissions for clinical relapse amongst over 10 000 cases of syphilis treated with 606 and mercury whose records are accessible to the writer have been less than 1 3 per cent. Under mercurial treatment a soldier spent an average of



FIG 82. Same case as fig. 81 ten days after first injection of 606.

60 2 days in hospital during the first year of the disease, while the average time spent by soldiers under 606 and mercurial treatment at Rochester Row now is 25 days Considering the comparison from the point of view of the Wassermann test, I found, in an analysis of 402 soldiers whose sera were tested three months after two years regular mercurial treatment, that 45 5 per cent.

many cases where the prognosis was formerly uncertain and often bad. This applies especially to syphilitic iritis and to syphilitic meningitis. It is true that in cases such as myelitis, where the disease has been allowed to advance until irreparable damage has been done to delicate nerve tissues, a complete cure cannot be obtained but in these the improvement is practically always greater than was usual under purely mercurial treatment. In tabes, again, the result generally depends on the stage to which the disease has advanced. In early cases the modern arsenical remedy properly used, gives good hope of arresting the disease in later stages the outlook is not so certain but the treatment is almost always worth a trial, since the meningitic element in these cases which is responsible for many of the more distressing symptoms, is capable of great improvement. In general paresis most workers agree that modern arsenical treatment does not offer anything of value.

On the other hand, it is necessary to be on one's guard against being led into expecting too much from these remedies. The rapid effect on clinical lesions led to the belief, which still prevails in some quarters, that one or two doses of "606" or "914" are sufficient to cure any case of syphilis. Such a belief can be positively dangerous when put into practice, since the brunt of the relapse may easily fall on the central nervous system, as will be mentioned later in dealing with neuro-recurrences.

The Fate of "606" and "914" after Injection

A very large amount of research has been carried out with a view to determining what becomes of the arsenical preparation after injection, and the results of these investigations may be summarised briefly as follows.

After Intravenous Injection.—The remedy circulates as such for not more than about two hours, during which time the blood serum gives the chemical tests for "606" and "914" and shows a definitely anti-spirochetal power

Another improvement which the introduction of these arsenical remedies has effected is in the treatment of syphilis of the central nervous system and of such delicate structures as the eye, where it is necessary to get ahead of the syphilitic process as rapidly as possible, lest it cause



FIG. 84. Same as fig. 83, three weeks after commencing "606" and mercurial treatment.

irreparable damage. Under purely mercurial treatment it was always a matter of some anxiety as to whether the disease would be stopped before the patient was poisoned with the mercury or some delicate structure damaged beyond repair by the pathological process. At present one looks forward with confidence to a good result in

The storage of arsenic in the organs, particularly after repeated injections, is important, as it shows that it is not a safe plan to be guided entirely by the excretion of arsenic by bowel and kidneys in determining the intervals between doses. It does not follow that, because no arsenic can be found in the urine after eight days, successive doses can be administered with safety every eight days to an unlimited amount. The amount stored in the organs has to be reckoned with, and the difficulty is that this cannot be calculated with certainty

The Effect of "606 and 914" on the Tissues

The usual result of the injection is a fall in blood pressure, which lasts for two or three days afterwards, though, as a result of excitement, it may be raised during the actual injection. Probably the lowering of the blood-pressure is due to the vaso-dilator effect which has been so strongly emphasised by Milian. Naturally the vaso-dilator effect is more marked in some patients than others Milian considers that the serous exudation which results from wide dilatation of capillaries accounts for most of the untoward effects which have been noted at one time and another after injection of these remedies

Investigators have chiefly found that the injection is followed by a moderate leucocytosis (8,000 to 14 000 per c mm.), but a diminution in the number of red cells (by about 200 000 to 1 000 000 per c.mm.)

Judging by the histological findings in cases of death from "606 and "914" injections, and from experiments on animals, the chief toxic effect is exercised on the endothelium of capillaries. The changes have differed somewhat in patients who have died rapidly after an injection, but, as a rule one or all of the following have been found

(1) In the brain, punctate hæmorrhages around the capillaries, thrombosis of capillaries, and blood stasis.

( ) In the kidneys, capillary hæmorrhages especially in

Excretion commences in about five minutes, and *arsenic* can be found by ordinary tests in the urine for eight to ten *days after intravenous injection of a full dose of* 606 By more delicate tests, traces of arsenic can be found in the urine for months after the injection. The excretion of 914 is much more rapid after intravenous injection most of the arsenic having disappeared after *about eight hours* while practically none can be found after two days More arsenic appears to be excreted by the bowel than by the kidneys

After intramuscular and subcutaneous injection of 606 the excretion is much slower and more irregular as would be imagined from the local necrosis and encapsulation of the remedy which occurs The excretion of 914 after a similar injection is much more rapid *Though slower* than after the intravenous injection it approximates fairly closely to this

Repeated injections appear to slow the excretion and this is of some importance with regard to the cumulative effect of these remedies to be discussed below

A large amount of the remedy is taken up by the organs, especially the liver but practically all are agreed that it does not reach the parenchyma of the central nervous system in amounts which can be detected chemically Even in cases which have died of cerebral complications following the injection of one of these remedies no arsenic was found in the brain substance.

In other organs Stümpke and Siegfried found arsenic for months after an injection. In illustration of the cumulative effect of repeated doses, Ritter found arsenic in the liver of a rabbit up to thirty days after one injection when, in another rabbit, the injection was repeated after an interval of eight days arsenic was found up to seventy days after the second injection while, in a third rabbit, the result of three injections at intervals of eight days was that arsenic could be found up to a hundred days later

For instance, alcoholics are not good subjects for arsenical treatment of syphilis, and those who are constitutionally liable to dermatoses of various kinds seem to suffer more from "606" dermatitis than others.

Clinical Side effects, their Prophylaxis and Treatment

In roughly chronological order these are as follows:

A. During or immediately after the injection

(1) Vaso-motor disturbances, also known as anaphylactoid symptoms, or minor nitritoid crises.

(2) Syncope.

(3) Pain in the gums and teeth.

(4) Peculiar taste in the mouth.

B. Following the injection usually by a few hours, and occurring generally on the same day

(5) Rigor rise of temperature, and headache.

(6) Vomiting diarrhœa, pain in the back, and cramp in the legs.

(7) Urticaria, herpes (labialis and zoster).

C. At various times from a day or two to a month or longer after a single injection or a course of such:

(8) Albuminuria.

(9) Stomatitis.

(10) Chronic headache lassitude loss of appetite, weight, and sleep.

(11) Erythema and dermatitis.

(12) Jaundice.

(13) Severe cerebral symptoms.

To consider the above rather formidable list in detail

(1) The vaso-motor symptoms, which have also been designated by different authors as "anaphylactoid" or as nitritoid crises, vary somewhat in degree and occur only after intravenous injections. The most usual symptoms are puffing of the face, dilatation of the pupils, rapid pulse, *feeling of constriction* about the mouth and throat,

the outer half of the cortex and tubular nephritis, with *necrosis and calcification of epithelium of the tubules*

(3) Hæmorrhages into lung alveoli.

The same changes have been found in animals killed with overdoses of 606 and 914

In fatal cases of dermatitis the result of 606 and 914 injections petechiæ are often seen in the skin, and I have seen large numbers of submucous petechiæ and ecchymoses in the bowel

Some workers have recorded considerable degeneration of liver cells in fatal cases of jaundice due to these remedies, *and changes similar to those found in acute yellow atrophy* but no particular degeneration of cells was found in the only fatal case of jaundice which I have seen. On the other hand it must be remembered that acute yellow atrophy may occur as a complication of syphilis, and, if any of the arsenical preparations have been administered, these may be blamed In a case of acute yellow atrophy of the liver which I saw about two years ago it happened that no suspicion of the syphilis had arisen before the jaundice appeared On account of the intensity of the latter the arsenical preparation was withheld otherwise it might have been blamed for the fatal result. On the whole, therefore, it does not seem to be definitely proved that the newer arsenical remedies exercise a very toxic effect on the liver cells In the fatal case of jaundice mentioned above the type was obstructive, the chief finding being catarrh of the duodenum and the common bile duct at its entrance into the duodenum

As mentioned, the weight of evidence is in favour of 606 and 914 exercising their main toxic effect on capillary endothelium, resulting in leakage of serum or blood into the surrounding tissues. Experimental evidence seems to show that if the capillary is, so to speak, under a handicap the effect of the arsenical preparation is much more pronounced. Besides animal experiments, there is a fair amount of clinical evidence in support of this.

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and perhaps some precordial distress with coughing In a more severe degree the face becomes intensely congested the lips and tongue may swell considerably the precordial and respiratory distress are great, and there may be convulsive twitching of the limbs. If the symptoms commence after the patient has left the table and before he has got to bed he may lose consciousness, or this may occur on the table. Sometimes immediately after an attack, the body is covered with urticaria. Usually all symptoms have passed off in about half an hour but exceptionally they may persist for several hours. As to their frequency on an average, one would judge the proportion all the year round to be rather less than 1 per cent of injections.

As to their causation, opinions differ but the evidence is against their being due to anaphylaxis.

Milian attributes the symptoms to serous exudation following on vaso-dilation. If this occurs in the brain, a form of serous apoplexy results, giving rise to cerebral symptoms of greater or less severity which may not be manifested for a few days as in the cases where the patient develops convulsions. A milder degree of the same cerebral vascular dilation would cause more or less severe headache. Owing to the similarity of the symptoms to those produced by amyl nitrite, he named the symptoms nitritoid crises, and recommended for their treatment the intramuscular injection of 1½ to 2 c.c. of a 1/1 000 solution of adrenalin hydrochloride. The exhibition of this remedy has been found efficacious at Rochester Row both therapeutically and prophylactically the latter in cases which have previously been affected Often a smaller dose, say 10 to 15 mm. of adrenalin 1/1 000 injected immediately prior to the administration has prevented the symptoms from appearing in a patient who has previously suffered from them.

(2) **Syncope.**—It is a fairly common event for a patient to become faint during the injection. In the majority of

instances the cause is mental, and in the remainder it is usually found that the patient has indulged in a meal immediately before the injection. In the latter case the symptoms are the prelude to an attack of vomiting

(3) Pain in the gums and teeth occurs most often in stomatitis cases. The symptoms are probably vaso-motor in origin, the added congestion of the gums produced by dilatation of the vessels causing the pain. If this is correct, pain in the gums, etc. could be regarded as a minor form of the symptoms mentioned under (1).

(4) A taste of garlic, or of ether or chloroform during the injection was considered by Milian to be a minor sign of intolerance. It occurs most frequently when concentrated injections are being given, and does not appear to be a sign of any great importance.

(5) Urticaria during or immediately after the injection is comparatively rare, but when it does occur then it usually succeeds a severe vaso-motor reaction. It is rather more common as a later event.

(6) Rigor, rise of temperature, and headache are amongst the commonest sequelæ of arsenical injections. The symptoms usually appear within two hours and have generally disappeared by the following morning. Rigor and headache are usually so slight that the patient would not mention them unless questioned; the rise of temperature is exceptionally to 104° F. or even 105° F., but in the vast majority of cases it does not reach 101° F. In frequency these symptoms vary very greatly with the type of case, and practically all agree that with modern technique they are by far the most frequently found after first injections, especially in cases of generalised syphilis.

(7) Diarrhœa and vomiting are much less common, and are usually very slight, the diarrhœa being limited to two or three loose motions, and the vomiting to little more than retching. Very occasionally one or both may be very severe and accompanied by pain in the back and cramps in the legs. It usually happens in these cases that a

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TABLE II

REACTIONS AFTER DIFFERENT DOSES OF 606 AND 914

(*Separate Series from that shown in Table I*)

			No. of Injections	Temperature. Total over 100°	%	Headache. Slight.	Severe.	Total.	%	Diarrhoea. Slight.	Severe.	Total.	%	Vomiting. Slight.	Severe.	Total.	%
0·2 grm.	606	Sal	149	52	34·9	18	19	37	24·8	3	1	4	2·6	8	4	12	8·0
		Khar	349	89	25·5	29	48	77	22·0	3	1	4	1·1	10	6	16	4·5
0·4 grm.	606	Salv	49	10	20·4	2	6	8	16·3	1	1	2	4·0	4	1	5	10·2
		Khar	65	13	19·3	3	4	7	11·3	3	—	3	4·6	3	4	7	11·3
0·5 grm.	606	Salv	73	17	23·3	10	4	14	19·2	1	3	4	5·4	14	1	15	20·5
		Khar	144	22	15·5	13	10	23	15·9	4	—	4	2·7	8	9	17	11·8
0·45—0·6 grm.	914		603	29	4·8	55	50	105	17·4	10	1	11	1·8	29	13	42	6·9

Salv = Salvarsan. Khar. = Kharsivan.

606 given intravenously. 914 given intramuscularly or subcutaneously.

TABLE I

REACTIONS AFTER 1ST 2ND 3RD AND 4TH INJECTIONS RESPECTIVELY OF 606" AND 914

After	No. of Injections	Temperatures. 100° 101	101 102°	102° 103°	103° 104°	104° and over	Total over 100°	%	Headaches. Slight	Severe	Total	%	Diarrhoea Slight	Severe	Total	%	Vomiting Slight	Severe	Total	%
1st Injection	803	93	91	77	62	16	328	40·9	228	74	302	38·3	130	27	160	20·6	80	24	101	12·0
2nd Injection	767	48	7	5	5	1	66	8·6	71	22	93	12·5	57	6	63	8·2	13	2	15	1·9
3rd Injection	614	16	18	6	6	—	46	7·4	61	19	80	13·0	35	6	41	6·5	12	8	20	3·2
4th or later	110	6	4	1	—	—	11	10	16	2	18	16·2	12	3	15	13·6	0	2	11	10
Totals	2,291	162	120	89	63	17	431	10·6	370	117	406	21·1	213	42	285	12·4	114	36	150	6·5

606 given intravenously

914 given intramuscularly subcutaneously

TABLE II

REACTIONS AFTER DIFFERENT DOSES 606 AND 914

(Separate Series from that shown in Table I)

[illegible]			No. of Injections	Temperatures: [illegible] over 100°	%	Headache: Slight	Severe	Total		Diarrhœa: Slight	Severe	Total	%	Vomiting: Slight	Severe	Total	%
0·3 grm.	606	Salv	140	52	34·9	18	19	37	24·8	3	1	4	2·6	8	4	12	8·0
		Khar	349	90	25·8	9	48	77	22·0	3	1	4	1·1	10	6	16	4·5
0·4 grm.	606	Salv	49	10	20·4	2	6	8	16·3	1	1	2	4·0	4	1	5	10·2
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number of patients are affected on one day and investigation then discloses some error in technique Tables I and II illustrate the experience at Rochester Row regarding the symptoms mentioned under (6) and (7) They show how much more frequently these occur after first than after subsequent injections.

(8) **Herpes labialis**, and occasionally **herpes zoster** are very infrequent. Often they follow very closely on the heels of severe attacks of vomiting and diarrhœa.

(9) **Albuminuria** is not common after injections of 606 and 914 Rarely it is accompanied by casts. More often albuminuria precedes the first injection and disappears afterwards. Appearing for the first time after the injection, it is naturally an indication for caution as to succeeding doses. Another indication for caution is marked diminution in the quantity of the urine passed in twenty four hours.

(10) **Stomatitis.**—Except for the pain in the gums at the time of injection stomatitis has apparently not been attributed in the literature to the arsenical preparation. This is probably because most workers treat syphilis by the combined arsenical and mercurial method and any stomatitis which may occur is attributed to the mercury It is the strong impression of the writer however that patients on combined arsenical and mercurial treatment suffer more frequently from stomatitis than those under purely mercurial or arsenical. Probably the latter remedies may not be nearly so active in causing stomatitis but add sufficiently to the irritation produced by the mercury to precipitate a stomatitis which would not otherwise occur

(11) **Chronic headache, lassitude, loss of appetite, general malaise, insomnia, and loss of weight** which are occasionally displayed during the later parts of a course of injections. They are signs of intolerance to the arsenical preparation and indications for caution regarding succeeding doses.

(12) **Dermatoses** in the form of **urticaria** have already been mentioned. Some patients complain of **itching** of

some particular part of the body after each injection, and this may be a sign of intolerance. Patients occasionally display and that after a number of injections have been administered, an erythema, which may be punctate or morbilliform; so much so that a diagnosis of German measles may be made. It may be limited to a small portion of the body and disappear in a few days, or may spread all over the body and then usually develops into severe exfoliative dermatitis.

In the latter event, which is fortunately rare, the body is covered with a scarlatiniform erythema, and the face becomes considerably swollen. Numerous blisters or pustules form, and the breaking of these leads to crusts and scabs, especially at the flexures. The condition is accompanied by most extensive exfoliation of the epidermis, and there is considerable pruritus. With the exfoliation, large areas of the skin become weeping and eczematous, and pustular folliculitis is a troublesome complication, which persists far on into convalescence. In severe cases petechiæ make their appearance and are not a good sign. The skin assumes a deep red-brown tint, and after scaling the patient looks generally as if he had been boiled. The skin remains in a harsh, semi-atrophic condition for many weeks after the acuter symptoms have passed away and considerable pigmentation results. There is xtensive loss of hair and hyperkeratosis of palms, soles, and nails sometimes occurs.

The constitutional symptoms may be slight, even in cases of severe dermatitis, but in these the health naturally suffers from the loss of sleep and other causes incidental to the discomfort which the skin condition entails. In other cases there is considerable rise of temperature, with severe headache and diarrhœa may be very troublesome the tongue becomes dry and brown, and the patient passes into a condition of toxæmia which is very similar to that seen in typhoid fever Broncho-pneumonia is another serious complication of dermatitis, and particularly fatal.

The general nutrition suffers severely in most cases, and recovery is often a matter of many months.

As to the incidence of dermatitis, little information is available from the literature. Brauer stated that dermatoses occurred in 1 per cent. of his cases. In a hospital which was formerly under my control the incidence of dermatoses of all kinds in the course of 80 000 injections to about 10 000 patients has been 26 severe, 24 moderately severe, and 74 classified as mild or trivial, including limited urticaria or a total of 124 cases of all kinds.

There were eight deaths as a consequence of complications which occurred in certain of the cases. In six of these there was a greater or less degree of broncho-pneumonia, and in two the symptoms simulated more closely those of typhoid fever In three of the five cases on which a moderately detailed report of the post mortem examination is available a noticeable feature was the presence of a number of small submucous ecchymoses in the large and small bowel. These varied in number from about ten patches, each about the size of the finger nail, to innumerable linear ecchymoses throughout the small intestine. In another case not in this series the large bowel contained a considerable amount of effused blood, though no blood had appeared in the motions during life. The number of injections which these cases had received before the outbreak of the dermatitis was 4 5 6 8 8 8 8 and 8 the dose in each case being 0 3 grm, and the symptoms commenced from 8 to 28 days after the last injection.

Table III shows the number of injections of 0·3 grm 606 which preceded the dermatoses mentioned above. The table shows that more than half the severe cases had received seven or more injections more than half the mild cases three or less Naturally treatment was stopped, or continued very cautiously after the slightest sign of skin trouble, so that the fact of a patient s skin remaining tolerant throughout the greater part of a course of injections is no guarantee that the attack will be a mild one.

TABLE III

SHOWING INCIDENCE OF DERMATOSES OF ALL KINDS IN 10 000 CASES UNDER 606 AND MERCURIAL TREATMENT ACCORDING TO THE NUMBER OF PRECEDING INJECTIONS (0.3 GM.) 606 INTRAVENOUSLY

Degree of severity		Number of Preceding Injections of 606															
											10		1	11	14	1	1
Severe	No. of cases	—	—	6	5	4	—	3	7	—	1	—	—	1	1	—	1
Moderately severe	No. of cases	—	4	10	3	5	2	1	3	—	—	—	—	—	—	—	—
Mild or trivial including urticaria	No. of cases	2	10	27	7	8	1	9	9	1	—	1	1	—	—	—	—
Total		3	14	43	12	13	3	13	18	1	1	1	1	1	1	—	1

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TABLE III

Showing the Incidence of Dermatoses of all Kinds in 10 000 Cases under 606 and Mercurial Treatment and the Number of Preceding Injections (0·3 grm.) 606 Intravenously

Degree of severity		Number of Preceding Injections of 606															
												1	12	13	1	1	
Severe	(No. of cases)	—	—	8	2	4	—	3	7	—	1	—	—	1	1	—	1
Moderately severe	(No. of cases)	—	4	10	3	3	3	1	2	—	—	—	—	—	—	—	—
Mild or trivial, including urticaria	(No. of cases)	2	10	27	7	6	1	9	0	1	—	1	1	—	—	—	—
Total		2	14	43	12	13	3	13	18	1	1	1	1	1	1	—	1

The treatment of dermatitis may conveniently be considered later with that of other side-effects

(13) *Jaundice is much less frequent than dermatitis* In my experience, it has occurred in about 0·6 per cent of cases which have received a number of injections. The symptoms are usually those of the ordinary obstructive type and are very persistent During the past year small outbreaks of acute yellow atrophy have occurred in certain hospitals The patients have usually been those who have received a full course of an arsenobenzol compound (from 2 4—4 2 grm in 6—10 weeks) with mercury and the symptoms have appeared from a day to three months after completion of the course The exact *cause of these outbreaks is not yet clear Most of the* military hospitals treating syphilis have never seen a case and in the hospital which suffered most all the fatal cases were confined to two out of four lines of huts in which syphilis cases were housed The probability appears to be that the patients suffered from some intestinal infection not in itself sufficient to cause the acute jaundice, but sufficient to make the liver more susceptible to the toxic effect of the arsenobenzol compound

(14) **Severe cerebral symptoms** characterised by intense headache, followed by mental confusion epileptiform convulsions, coma, and in some cases death, have been recorded by a number of writers They have become much less frequent in later years, probably owing to the greater caution which is now exercised as to initial doses and care over the purity of solutions. Thus, Ravaut reporting on recent French Army medical experience, records no death but two cases of epileptiform convulsions (one neo-salvarsan and one galyl) in the course of 94 702 injections I have not seen a fatal case of epileptiform convulsions but have received reports of five such deaths which have occurred in an estimated total of about 500 000 injections. In addition to this two patients under my care had each a single epileptiform con

vulsion six weeks after completion of a course of treatment, but recovered without apparent after-effect. Another patient, at Rochester Row had a series of convulsions on the day after his third injection, and was stuperose the following day He recovered rapidly under energetic treatment.

The sequence of events in fatal cases, as usually described, is as follows. Within a period which ranges in the great majority of cases from 24 to 124 hours after the injection, there is a complaint of intense headache with mental confusion, which is quickly followed by a series of epileptiform convulsions though convulsions may not occur the patients become cyanosed, and comatose, with marked Kernig and Babinski signs, incontinence of urine and fæces, and rise of temperature (to perhaps 108 F) and die within twenty four hours of the onset of the symptoms. In some cases there is complete suppression of urine; in others it is scanty and full of albumen; and in still others no particular changes have been noted in this respect. Sometimes there is a temporary pause in the symptoms, which may return, however and the patient die some days after the onset.

In milder cases, a few epileptiform convulsions are followed by unconsciousness for a number of hours, and the patient then recovers. In others, the cerebral symptoms have manifested themselves by temporary loss of memory which has lasted sometimes for as long as two weeks. As Milian remarks, between the vaso-motor reactions noted under (1) and the severest of the symptoms under discussion, there may be all varieties of cerebral disturbance.

The main post mortem appearances which have been recorded in these cases have already been discussed (p 373).

The Ætiology of Side-effects

The factors concerned in the above side-effects may be considered from the points of view of susceptibility of the patient and toxicity of the remedy

The varying susceptibility of patients to the toxic effects of 606 and 914 must be clear to anyone who has witnessed the behaviour of many hundreds of patients injected under identical conditions It is generally recognised that, even excluding cases in which there is indication for caution in regard to dosage, it is impossible to tell by examination of an apparently healthy patient before he receives an injection whether or not he will be intolerant of the remedy It is for this reason that the majority of authors recommend a cautious start in regard to dosage, and that a close watch be kept on the patient for signs of intolerance as the course of treatment proceeds These have been mentioned above in detailing the side-effects, and require little comment. One may summarise them by saying that when a patient suffers from a severe reaction after each injection or when this is prolonged into the next day he should be regarded as intolerant Similarly when he begins to display the signs mentioned under (11) above, or shows any erythema or jaundice, it is an indication for the greatest caution, if not for stopping the remedy altogether

The Susceptibility may be increased Artificially—It has generally been found that patients who have fasted for some hours prior to the injection, and have taken a laxative the night before, have suffered much less from reaction than those who neglected these precautions. Milian believes that the preceding diet should be arranged so as to render the blood strong in basic substances, in order that the injected remedy may not disturb the reaction of the blood. For this reason, he recommends restriction of meat, acid salads, and fruit, and the giving of milk and vegetables This is supported by many writers It is generally considered, too that exertion or the taking of food soon after injection, increases the susceptibility to the remedy Though clinical evidence on this point is not very convincing it can safely be said that patients who refrain from food for some hours afterwards are much less likely

to vomit. Possibly too, on account of the lowering of blood-pressure, a patient is not very fit for exertion after an injection.

Alcoholics are generally more susceptible, if one may judge from the case-records of deaths. Probably this is due to the toxic effect of the remedy being exercised on blood vessels which are already diseased, especially the kidney vessels. Possibly too the perverted metabolism of an alcoholic favours more rapid decomposition of the remedy within the organs and tissues.

Mercury is believed by Loewy and Wechselmann to increase susceptibility to "606" and "914." They found that animals which had been treated previously with mercury died of smaller doses than controls, and hold that the mercury renders the vessels more susceptible to the toxic effect of the arsenical preparation. In this connection it may be mentioned that *pregnancy* is a condition in which there is reason to feel anxiety regarding the kidney functions, and Gennerich, otherwise a supporter of the combined treatment, would withhold mercury from women who are pregnant.

Cold seems definitely to increase the susceptibility to dermatitis, since this is more severe in winter. This is an indication, naturally, for the protection from chill of patients undergoing arsenical treatment.

The stage of the disease at which treatment commences is another factor in the susceptibility to reaction. It is generally accepted that the administration of an anti-syphilitic remedy, whether mercurial or arsenical, to a person suffering from syphilis may result in a transitory exacerbation of all symptoms. The phenomenon is known as the Jarisch Herxheimer reaction, and is believed to be due to destruction of spirochaetes and release of their toxins. It can easily be observed in syphilitic skin and mucous membrane lesions *on the day of the first injection* of "606" or "914" or on that following it. It is a fairly common event to see increased redness and swelling round

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a primary sore on the following day while intensification of the rash and shortly afterwards increase in the strength of the Wassermann reaction are other manifestations of this phenomenon. As shown (p 275) the increase in the strength of the reaction or the production of a positive reaction in a patient who was previously negative, by the injection of a small dose of "606" or "914" is now put to practical use in determining the question of cure and in deciding sometimes as to the syphilitic nature of obscure cases where the Wassermann reaction is negative or doubtful

As to the effect of a Jarisch Herxheimer reaction on the central nervous system the cases collected by Ehrlich are very interesting Thus Beck Biehl Simchowicz, and Mongrovius reported on four cases of paralysis of the auditory nerve which came on from a few hours to ten days after injection. Makrokl recorded a case of paralysis of the oculo-motor nerve two days after and Claude, one of facial paralysis three days after an injection of "606" These early cranial nerve disturbances were attributed by Ehrlich to increase of reaction in a syphilitic infiltration of the meninges around the nerve in question, as a consequence of the injection, just as is seen so often in visible syphilitic lesions They should be distinguished carefully from those later disturbances known as neuro-recurrences, which occasionally come on some weeks after cessation of ... treatment, and, as will be shown later are relapses of the syphilitic process around these nerves. The evidence is also strongly against the severe cerebral symptoms described on p 384 being due to a Jarisch Herxheimer reaction.

It is possible that rigor fever and headache are often of the nature of a Jarisch-Herxheimer reaction, if one may judge from the fact that, as shown in Table I, irrespective of the dose employed, these symptoms are by far the most frequent in occurrence after the first injection administered to cases of late primary or early secondary syphilis.

Further when a mercurial course precedes the arsenical injection, no reaction occurs or at any rate the frequency is reduced to that of cases in much later and much earlier stages of the disease.

The Factors concerned in Increasing Toxicity of the Remedies

Water Impurities.—Since Wechselmann first pointed out that reactions were much more frequent and severe after injections of arsenical remedies which had been prepared with stale saline and distilled water than when solution was effected in freshly distilled water and saline made from such, considerable research has been carried out to determine the part which water impurities play in the causation of reactions. While practically all observers now agree that the use of freshly distilled water has effected a very considerable reduction in the severity and frequency of the reactions observed in the early days, opinions are divided as to whether water impurities are the sole cause of these disturbances.

Some observers have considered the matter from the point of view of toxicity of the saline itself rather than from that of interaction between the water impurities and the arsenical preparation. Wechselmann held that the reaction was du to insufficient sterilisation of the water and the simultaneous injection of bacteria which had grown in the water since it was first distilled. He demonstrated that water which stood in laboratories and dispensaries became heavily contaminated.

McIntosh, Fildes, and Dearden showed that saline which was kept sterile in Jena flasks from the moment of distillation produced no fever. If contaminated, however though injected after heat sterilisation (the dead bodies of the bacteria remaining in the water), fever resulted. If redistilled, or sterilised by filtration through a Pasteur candle no reaction resulted. The conclusion was that

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it was the dead bodies of the bacteria which produced the fever

These observations relate only to fever produced by saline itself Another point of view which must be con sidered is the effect of water impurities in raising the toxicity of the arsenical preparation when in contact with it

Yakimoff and Kohl Yakimoff showed that the toxicity of 606 was increased several times by simultaneous injection of the animal with various micro organisms and Ruhemann considered that in some cases reaction may be increased by the presence of micro-organisms in the blood, as in septic conditions. Gonder found that the presence of small quantities of calcium and magnesium (as are found in tap-water) and also that of *B coli* and *B pyocyaneus* in the water increased the toxicity of 606

Emery is very insistent in the importance of excluding impurities from the distilled water He considers that it is not sufficient to be satisfied merely with the fact that the water is freshly distilled when the still is provided with any but a hard glass condenser it may produce pure water at first, but after a time the steam acts on the glass, which gives off to the water metal and silicates which add to the toxicity Some condensers last a very short time, while others may remain satisfactory for two months or so before beginning to produce water which results in the production of reactions. He now considers that if a Bohemian glass condenser is used, it should be abandoned after distilling about 60 litres, or less if reactions begin to make their appearance. The best still is one made of hard glass throughout.

Lévy Bing found that severe reactions followed injections of 606 whilst he was using a copper still.

Amongst those who do not attach such great importance to impurities in water from the point of view of reactions, are Marschalkó and Veszprémi These authors found that bacterially contaminated water did not materially increase

the toxic effect of "606" for animals, and considered that ordinary bacteria play only a small part in this respect. It is of interest, however that in their experiments they had found that 0·1 grm. "606" per kilogramme killed five out of ten rabbits when the drug was prepared with presumably pure water. On the other hand, when bacterially contaminated water was used, a dose of 0·06 grm. per kilogramme killed four out of five animals, so that the contamination appears to have produced an increase of toxicity which was not so trifling as these authors considered. It may be remarked in this connection that, clinically there is a marked difference shown in the respective toxic effects of two samples of "606" which differ by as much as 0·02 grm. per kilogramme in their lethal dose for animals. In spite of their sceptical attitude towards its importance, Marschalkó and Veszprémi would always follow the recommendation to use water which was freshly distilled.

My own experience, which is based on clinical observation and animal experiments, leads to the belief that purity of the water solutions used in the preparation of "606" is important, especially with some batches. From this point of view batches may be divided into two categories:

Category A.—Safe even with a technique which is less than good in its attention to detail.

Category B.—Safe, if dissolved in water from a good still, alkalised carefully and strained or filtered before injection, but very liable to cause vaso-motor disturbance if these precautions are not observed.

The following observations may illustrate this. A certain batch of "606" was noticed to be causing more vaso-motor disturbance than usual. The remainder of the batch was sent to Rochester Row where 197 injections of it were given without untoward effect. Then nine injections were administered after the "606" had been dissolved and prepared with boiled tap-water solu-

tion. Four patients suffered from severe vaso-motor reaction during the injection. It happened that two were susceptible to vaso-motor disturbance, but the other two patients had not previously nor have they since suffered from this effect. Experiments with this batch on rabbits showed that

(1) Prepared with distilled water solution, 0 1° grm. per kilogramme was just tolerated.

(2) Prepared with tap-water solutions, all rabbits died at once after 0 12 grm. per kilogramme, and the maximum tolerable dose of the batch prepared in this manner was 0 10 grm. per kilogramme.

Another batch of 606 was treated similarly and all animals survived doses of 0 18 grm. per kilogramme, even though prepared with tap-water Clinically this batch was very well tolerated.

Clinical observations lead also to the belief that, when a slight excess of alkali is employed in the preparation of 606 for injection there is less likelihood of reaction. As to the effect of strength of saline, I cannot judge, but in practice use 0 5 to 0 6 per cent.

The prophylaxis of side-effects has been considered with the discussion as to their ætiology and may be summarised shortly thus

Patients should be prepared for injection much as for general anæsthesia, and should remain quiet for the remainder of the day though it is usually possible, especially in the later stages of the course, to allow them to return home after a few hours The patient should be well housed and clothed and his diet simple throughout the course.

Solutions should be prepared in water and saline which are above suspicion from the point of view of impurities. In the absence of a reliable still, solution according to the method described on p 353 appears to be equal to that with good distilled water

In patients who have previously shown signs of vaso-

motor disturbance the prophylactic injection of adrenalin is valuable.

In view of the fact that it is impossible to detect an abnormal idiosyncracy in an otherwise normal patient the initial dose should be such as can be borne without danger by the most susceptible, and the subsequent doses increased only very gradually. In this respect, almost all workers agree that, in the absence of any particular contra-indication, 0·3 grm. of "606" is a safe initial dose for practically every man, 0·2 grm. for women, and 0·01 grm. for infants of a few weeks.

The intervals between the injections should have regard to the well-recognised cumulative effect of these arsenical preparations, and it is unsafe to rely entirely on the excretion of arsenic by the urine as a guide to the length of the interval. Generally speaking however in the absence of signs of intolerance 4 7-day intervals between doses of 0·3 grm. ~ 10-day intervals between doses of 0·4 grm. and 0·5 grm. and a pause of two to three weeks after the administration of each total of 0·8–0·9 grm. are safe. A careful watch should be maintained on the urine for defective diuresis, albuminuria, and casts. Minor signs of intolerance are valuable indications for reduction of subsequent doses and for increase of intervals beyond the ordinary.

The Treatment of Side Effects

For vaso-motor disturbances the intramuscular injection of adrenalin is generally effective. The dose originally recommended was 1 to 1½ c.c. of a 1/1,000 solution, but smaller amounts have often proved effectual.

Ordinary reactions require no further treatment than rest but for high fever and severe headache, most workers recommend aspirin or pyramidon in the usual doses.

In a case of generalised erythema with high fever and intense headache I once removed 18 ounces of blood by venesection, with immediate relief to the headache, and

the fever and erythema had completely disappeared by the following morning Similar cases in which severe symptoms were aborted by venesection were subsequently reported to me by officers working in other hospitals. In a third case of my own intense headache and pruritus were relieved at once by venesection to 10 ounces, but the erythema was not aborted and the patient subsequently developed exfoliative dermatitis. Phlebotomy is to be recommended, therefore, since it can do no harm and may procure relief of the distressing symptoms.

In addition to phlebotomy one would recommend the free use of saline purges, and the taking of large quantities of bland liquids.

The treatment of exfoliative dermatitis is troublesome. The injection of intramine as recommended by McDonagh acts well but is painful Prof Bolam Newcastle, recommends ichthyol 5 grains in a capsule night and morning and I have found this better than any other general remedy Calamine lotion and powder bran baths, and starch poultices are very soothing while 10 per cent. ichthyol ointment appears to be successful in places where there is much pustulation. The diet should consist of milk and milky puddings with large quantities of barley water avoiding meat and eggs Paraffin and saline are good aperients, and preferable to mercurial preparations. The patient's body should be carefully protected against chill especially in cold weather

Jaundice is treated with alkaline sedatives, such as bismuth and soda in large doses, while paraffin seems to be the best aperient.

In the treatment of any severe cerebral disturbance following the injection of one of these remedies, prompt measures may make all the difference between recovery and death. The following routine appears to be the most rational and hopeful

(1) Removal of 15–20 c c cerebro-spinal fluid by lumbar puncture.

(2) Phlebotomy to 15–20 ounces.

(3) Intramuscular injection of 1–1½ c.c. adrenalin hydrochloride 1/1,000

NEURO-RECURRENCES

Shortly after "606" came into general use it was noticed by several observers that symptoms referable to disease of the central nervous system had become much more prevalent, and this constituted the main basis of an attack on the new remedies by Finger, Gaucher and many other syphilologists of high standing.

The symptoms which were chiefly noted were paralysis of one or more cranial nerves, especially the seventh and eighth, and a certain number of cases of paraplegia and hemiplegia were recorded. These untoward sequelæ usually came on six to eight or more weeks after the injection. Finger's view, in which he was supported by numerous observers, was that these nerve disturbances were either directly due to the toxic action of "606" or, if syphilitic in nature, they were the consequence of the "606" having produced a *locus minoris resistentiæ* for the parasite. In Finger's cases, 9 per cent. had developed cranial nerve trouble after "606," while in the previous three years he had seen very few similar cases under mercurial treatment. Finger's views were hotly contested by the admirers of the new therapy, some of whom were too zealous and spoilt their case by attempting to prove that such disturbances were no more frequent now than under the old mercurial treatment. There can be no doubt that these cases were much more frequent at that time than they had been under mercurial treatment, although Finger's estimate was considerably higher than the experience of other clinics justified.

Ehrlich's view was that these central nerve disturbances were the result of insufficient treatment. He held that, when the treatment commenced after the disease had become generalised and was insufficient completely to

sterilise the patient, certain spirochætes, situated for example in the membranes surrounding the cranial nerves, eventually woke up and setting up a reaction there, destroyed the continuity of the nerve. This view was well supported by the facts collected by Benario, which showed briefly that

(1) In early generalised syphilis the disease affects the meninges almost as frequently as the skin and mucous membranes. The same condition is found in neuro-recurrences.

(2) The incidence of neuro-recurrences is inversely proportional to the amount of treatment which the patients have received.

(3) Prompt treatment with one of the newer arsenical preparations generally results in disappearance of the neuro-recurrence.

This view is well supported by ascertained facts, which may be mentioned under the same headings.

(1) *Ravaut found long ago that in secondary syphilis* cerebro-spinal fluid showed pathological changes in the shape of increased numbers of leucocytes and increase of *globulin in 67 per cent. of cases* *Altmann and Dreyfus* found increase of pressure, cells or globulin or a positive Wassermann reaction, or all these combined, in nearly *80 per cent. of secondary cases* *Gennerich found that* nearly 90 per cent of relapse cases after 606 treatment showed some pathological change of a syphilitic nature in the cerebro-spinal *fluid and believes that if in the case of* secondary syphilis which showed no changes the fluid is examined after a small dose of 606 or "914 has been *administered (provocative injection) practically every* one would be found to have a pathological cerebro-spinal fluid C H Mills in an examination of cases at Rochester *Row found increase of cells or of globulin* or a positive Wassermann reaction, or all three in 47 per cent of secondary and 32 per cent of tertiary cases which showed no symptoms *of central nerve disease.* As an example *of*

the degree of histological change which may be present without manifest nerve symptoms one patient suffering from recurrence with secondary symptoms, five months after a single injection, had 770 cells per c.mm., globulin, and a double plus Wassermann reaction in the fluid of amount (1) shown on p. 281

These facts show the frequency with which the central nervous system is involved in syphilis Similar changes are found in practically every type of neuro-recurrence or disturbance of the central nervous system after arsenical treatment, and in the few cases which show no change the symptoms practically always point to syphilitic endarteritis of a cerebral vessel.

(2) It is the experience of all that neuro-recurrences have become much less frequent with the gradual increase of arsenical dosage which has occurred as a result of experience.

In this connection may be quoted the results from the French Army collected by Ravaut, who reports only two cases of facial paralysis one paraplegia, and one oculomotor paralysis in the course of 94 762 injections.

A course containing 2 4–2 8 grm. "606" (in eight injections) and six or seven mercurial injections, which was instituted by the writer was followed by twenty neuro-recurrences in over 30 000 cases.

(3) The treatment of neuro-recurrences which is almost unanimously advocated is the prompt administration of "606" or 914 and mercury and the happiest and most permanent results are obtained when the arsenical preparation is pushed to an extent far beyond what is usual in ordinary routine work. I have not hesitated to administer totals of eight or more grammes of 606 to such cases, and have seen nothing but good result from this practice. This appears to be a complete answer to the contention of those who hold that the newer arsenical preparations have a neuro-tropic action. It would be well if those who have to report on neuro-recurrences in the future were to state

the exact amount and kind of treatment which the patient had previously received *Without this* information, a false impression, which is unjust to the arsenical preparation, may easily be conveyed

Whatever the theory may be as to their exact ætiology there can be no question that the prophylaxis of neuro-recurrences lies in a sufficient arsenical and mercurial treatment when the patient first appears It is a strange fact, however that though this has now been established for some years, there can still be found practitioners who will administer one or perhaps two doses of an arsenical preparation and allow the patient to go away unfurnished with any advice as to continuance of treatment.

THE CONTRA INDICATIONS OF 606 AND 914"

These may be divided into absolute and relative.

The absolute contra indications have become considerably reduced with experience as to the safety of small doses, controlled by careful observation of their side-effects and at present one would exclude only cases of Addison's disease, bleeders and those suffering from such advanced visceral disease that death must inevitably follow in a *short time.*

Relative Contra indications—There is a fairly general agreement as to the diseases the presence of which is an indication for caution as to dosage etc. These are visceral lesions such as myocarditis, renal, and hepatic disease arterio-sclerosis aneurism diabetes and advanced disease of the central nervous system. Pregnancy though hardly a disease, also requires caution.

Visceral disease may be syphilitic or otherwise. In those which are syphilitic, there is the fear that the exhibition of a large single dose at first may cause such a severe Jarisch Herxheimer reaction that the organ is fatally damaged. In this connection may be mentioned syphilitic disease of the central nervous system, where it is possible that a process affecting vital centres, either directly or through

their arterial supply may temporarily become so aggravated as to lead to the death of the affected centre. The cases recorded by Ehrlich above (p. 388) in which cranial nerves became temporarily paralysed, are examples of the same effect, though with less disastrous consequences, while a certain number of cases have been recorded in which paraplegia or hemiplegia have followed a full dose. Similarly in cases of syphilitic myocarditis, and in aneurism or aortic regurgitation, or in cases which suffer from angina pectoris, in all of which there is reason to believe that the coronary arteries are diseased, it is clear that a Jarisch Herxheimer reaction would be extremely dangerous. The same applies to severe syphilitic disease of the larynx.

In connection with disease due to other causes than syphilis, it will be recalled that published observations seem to indicate that the remedies under discussion primarily damage capillaries especially if these are in an abnormal state on account of existing disease. The existence of renal disease is important in this connection. Although it is recognised that the arsenical preparation can be given to patients suffering from mild albuminuria, even with casts, the indications are naturally for caution, since not only may a toxic dose precipitate a severe nephritis, but severe symptoms may result from undue retention of the remedy in the body. The occasions, however on which any anxiety is provoked by the presence of renal disease are extremely rare. It is usually found that patients suffering from albuminuria in the early stages of syphilis clear up in this respect after the first small dose, the albuminuria having clearly been syphilitic in nature.

The effect of these remedies on the blood-pressure makes it necessary to be careful over their administration to patients suffering from an abnormally low blood-pressure.

The tendency to hæmorrhages after injections emphasises the need for caution in cases of gumma of the brain, an example of which is a case recorded by Duguid and Graham in which a patient died seven days after a dose of 0·6 grm.

606' and post mortem, was found a gumma, four centimetres in diameter external to the anterior horn of the right lateral ventricle, which was *surrounded by a considerable* effusion of blood.

Alcoholics have already been mentioned as being susceptible to the toxic effects of 606 and 914 and naturally come under the category of cases in which the arsenical preparations are relatively contra indicated.

Attention does not appear to have been drawn to the care which should be exercised where the patient is constitutionally liable to dermatoses, such as eczema, erythema, and urticaria. In these it is reasonable to suppose that the skin vessels are in an abnormal state and likely to be still further damaged by the arsenical preparation, unless this is administered with due regard to its cumulative effect. Patients who suffer from severe seborrhœa of the scalp *seem particularly prone to dermatitis after injections* of 606, etc. In a case of this description at Rochester Row the interval between the first two doses of 0·3 grm. 606 was purposely lengthened to a week on account of the seborrhœa, but the second dose was followed by a pretty severe attack of dermatitis.

Caution with regard to the patients under the above categories applies not only to individual doses but to intervals between injections or in other words, to the total amount of the remedy administered within a given period. It is impossible to state in detail how each of the above cases should be managed, but by commencing with a dose of 0·1 grm. 606 or 0·15 grm. 914 increasing the intervals by 20–100 per cent and watching carefully for the signs of intolerance mentioned above, a safe course can usually be steered. An intramuscular injection of 0·2 grm. 914 is a useful procedure in commencing the treatment of men where there is reason to fear the result of severe reaction.

DOSAGE IN CASES WHERE THERE IS NO PARTICULAR CONTRA-INDICATION

This has already been referred to in connection with the prevention of side-effects, but the practice of different workers may be mentioned here in more detail.

Few or none would now employ a dosage such as that used by Schreiber at first with "914" namely 0·9 1·2, 1·35, and 1·5 grm. at intervals of two days, although his paper was written with an experience of 280 cases treated without ill-effects. A number of deaths occurred in other clinics as a result of the employment of this dosage, and Schreiber subsequently modified it very considerably.

Kromayer was probably the first to recommend frequent small doses giving 0·1 to 0·2 grm. three times a week to a total of 3·0 grm. Leredde, who is a believer in pushing the remedy in the later stages, insists on a small initial dose (0·1 grm. "914" followed by 0·3 grm. in eight days). Gennerich generally commences his cases with a dose of 0·1 grm. "606" while Emery, as also Fordyce, usually commences with 0·3 grm. for men who display no contra-indication.

These examples will serve to show the general recognition of the necessity for caution which now prevails with regard to initial dosage. Similarly, recognising the cumulative effect of these remedies, the former practice of administering large doses at short intervals has ceased, and the general custom now is to allow an interval of 7–10 days after the dose has reached 0·4 grm. "606," or its equivalent in "914."

Although the consensus of opinion is in favour of a cautious commencement in all cases, it is equally unanimous as to the necessity for administering a sufficiently large quantity to insure immunity from recurrence, and in condemnation of the practice which still unfortunately prevails in some quarters, of giving only one or two doses

The Respective Merits of 606 and 914

Opinions are divided as to whether 914 is equal therapeutically to 606 Most will agree that, in immediate effect, it is difficult to choose between them, but it is also difficult to overlook the opinion of such authorities as Gennerich and Dreyfus, amongst others who hold as the result of later observation, that 914 is not so powerful or permanent in its therapeutic effect.

Probably this has to do with the more rapid excretion of 914 after intravenous injections as has been shown above, since Wechselmann and Eicke have stated their opinion with which the writer concurs, that when administered subcutaneously so that it is excreted more slowly 914 gives better results than follow the intravenous injection of '606

As to toxicity it seems probable that, as pointed out by Schreiber in the first place, under a good technique 914 has the advantage. It must be remembered, however that 914 is a preparation which is much more liable to decompose, and that errors in technique, such as impurities in the solvent when it is given dilute, and delay in administering it, are visited with more certainty by serious after-consequences.

Galyl

Mouneyrat introduced in 1918 two new preparations—tetraoxy-diphosp-amino-diarsenobenzene or galyl, and phenyl disulph ammo tetraoxy diamino diarsenobenzene or ludyl, of which the former has survived and come into extensive use during the war It is a greyish yellow powder which is sold in ampoules, like the preparations already mentioned, and is prepared for administration by dissolving in distilled water which produces an alkaline solution. This may be injected either dilute or concentrated, and the doses usually recommended are 0·3 to 0·4

grm. intravenously The indications and contra-indications of galyl are similar to those of the other preparations

The immediate effect of galyl on syphilitic lesions and on the spirochæta pallida is similar to that of 606 or "914" but no accurate statistics are available as to the permanence of the results, since most of the reports make no reference to subsequent observation. As the result of later observation of patients who were treated with this remedy earlier in the war I believe that galyl is not therapeutically so powerful as the older preparations.

It has been claimed for it that galyl is less toxic, its intravenous injection not being followed by the vaso-motor and other disturbances which sometimes occur after injections of the other preparations. This claim is contested by Ravaut on the experience of over 8 000 injections administered in the French Army He considers that galyl is inconstant in make and more liable to be followed by side-effects. My own, smaller experience makes me believe that galyl injections are just as liable to be followed by side-effects as corresponding doses of 606 or "914"

Galyl is also prepared for administration intramuscularly being suspended in a fatty basis. Injected in this form it does not cause a great amount of pain but at Rochester Row doses of 0 4 grm. failed to cause spirochætes to disappear and the opinion formed was that, its effect is not equal to that of "914 administered by the same method. More recently it has been issued for intramuscular injection, dissolved in a solution of glucose. This is somewhat similar to the method of preparing "914 for injection, which is recommended by Balzer I have not sufficient experience to judge its value in this form.

LUARGOL

Luargol is a combination of dioxy-diamino-arsenobenzene with antimony and silver

The desirability of bringing more than one metal to bear

on the parasite at one time in the treatment of protozoal diseases was recognised by Ehrlich as the result of his researches on the chemio-therapy of trypanosomiasis.

On this principle with Karrer he produced salvarsan-copper a preparation which has been used with success in yaws and leprosy On the same hypothesis, Danysz has combined dioxy diamido-arsenobenzol with silver bromide and antimony Silver bromide was shown by Danysz to be a better antiseptic than the chloride, or nitrate, and antimony has long been a proved spirochæticidal agent.

The combination of Danysz, now known as luargol or 102 was shown to be seventy five times more active than atoxyl, and ten times more active than 606 against trypanosomes. Renault, Fournier and Guénot treated 500 primary and secondary syphilitic cases with luargol, using doses of 0 10 grm. which were increased gradually at intervals of three or four days to 0 3 or 0 35 grm. making a total of 1·2 to 1 5 grm. in six or seven injections. There was little reaction, but two cases developed a transient erythema. Spirochætes disappeared from lesions as rapidly after injections of 0 10 to 0 15 grm. luargol as after 0·3 to 0 4 grm. 606 and the clinical results were equally good. Primary cases with a negative Wassermann reaction remained negative. Secondary cases varied in this respect, but the results with them, which were obtained by injections of luargol, were not inferior to those produced by two or three times as much 606.

Other workers have reported similar results. Dalimier and Lévy Franckel treated a number of cases of very severe and malignant syphilis, and obtained results with comparatively small doses of luargol which were if anything more rapid than those produced by much larger doses of 606 or 914

At Rochester Row the immediate results have confirmed what has already been written. The reactions following injection of luargol are usually trivial, though one case of transient erythema was observed. Spirochætes

disappear rapidly after doses as small as 0 10 grm. and the clinical effect is equally prompt. The effect on the Wassermann reaction has not been worked out on a sufficiently large number of cases to justify any conclusion, but the results up to the present have compared favourably with those obtained by 606 intravenously

A disadvantage of luargol as first introduced was the thrombosis of veins which it caused at the site of injection. This has now been overcome by the introduction of disodo-luargol, a dark brown powder rather like emery powder which is ready for use when dissolved in distilled water which produces a very dark brown solution. It can be given dilute, like "606, or concentrated, like 914 or galyl, and has the further advantage that it is much more stable than 914 If it fulfils its present promise, disodo-luargol will have many advantages, but as to that point it is for the future to decide.

Mercurial Preparations

The discovery of 606 and allied preparations has stimulated considerable research directed to the discovery on the same lines of a compound of mercury which would be less toxic and of greater efficacy than those in routine use at the present moment. But although a number of compounds have been synthesised which promised well in animal experiments, it cannot be said that the position of the older preparations has yet been disturbed.

As to the administration, the choice for routine use rests between injections, inunctions, and the oral method. The last named is not generally favoured in the early stages of syphilis on account of the uncertainty of absorption, and the liability to gastric and intestinal disturbance which it entails. In certain cases, however oral administration may be valuable. Thus, after the patient has received a considerable amount of treatment with injections of 606 and mercury it may be impracticable for him to continue under such close supervision as these entail.

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In such cases I am in the habit of prescribing a pill or tabloid of grey powder or of grey powder and Dover's powder in order to maintain the effect

Between injections and inunctions, opinions are evenly divided There is no doubt that as good, if not better results are obtained by well administered inunctions as by injections, but nobody will deny that inunctions, to be effective, require skilled and conscientious application. As a general rule, they cannot be entrusted to the patient to carry out and, as they come within the province of the specialist, will not be considered here. Injections have the advantage of convenience and certainty Their technique is fairly easily learnt, and the matter is entirely in the hands of the medical attendant himself. The dose is definitely placed in the tissues, and the administration of the remedy does not depend either on the patient's memory or on the energy of his attendant

Injections may be intravenous or intramuscular The former have not enjoyed a great popularity for routine use but in cases where a quick effect is desired, without resort to arsenical preparations, the intravenous injection of the cyanide (1 c.c. of a 1 per cent. solution) or of the perchloride, daily or on alternate days, has proved valuable. Administered in this manner however mercury may rapidly produce toxic symptoms—dysenteric diarrhœa, nephritis, and severe stomatitis.

Regarding the preparations for intramuscular injection, a close discussion as to the respective merits of the soluble and insoluble preparations would be useless. Each has its equally powerful advocates, and the choice very largely depends on circumstances. Probably the great advantage of the soluble preparations is that, owing to the speed at which they are absorbed their effect is more rapid and, also, it is possible to approach with them more nearly to the toxic dose. On the other hand, it has to be remembered that, with present-day preparations, it is the weight of *mercury* introduced which tells in the ultimate therap—

effect, and the rapid absorption of the soluble preparations in an active form makes it impossible to inject at one time sufficient mercury to last for some days, so that injections must be given daily or on alternate days. Biniodide of mercury 1 c.c. of a 1 per cent. solution, is recommended for use in the French Army where the bibromide and the benzoate are also employed. Others prefer the perchloride gr $\frac{1}{16}$–$\frac{1}{4}$ every day or every other day made up thus

℞

Sodii Chlorid.	gr. 4
Aq. Destillat.	♏ 400
Dissolve filter and add Hydrarg. Perchlorid	gr. 8

Dose 3–10 minims, containing gr. $\frac{1}{16}$–$\frac{1}{4}$ of perchloride of mercury

The insoluble preparations have the great advantage that a single dose will usually suffice for a week's treatment, though probably the effect is not so rapid as that of the soluble preparation. Another advantage is that the effect is maintained for a much longer time after the course of injections has ceased, since the mercury continues to be absorbed from the site of the injection for some weeks. From another point of view this is a slight disadvantage, since a patient cannot be watched so closely for signs of intolerance. Thus, an overdose of a soluble preparation would rapidly produce symptoms and give timely warning not to repeat the dose, while in the case of an insoluble preparation the symptoms might continue long after suspending treatment, owing to the continued absorption of mercury from the site of the injection.

The insoluble preparations in most common use are metallic mercury in a state of fine sub-division, calomel, and mercury salicylate. Calomel and metallic mercury are suspended in an oily basis, of which there are numerous formulæ, the most popular in the Army being that associated with the name of the late Colonel Lambkin. It contains creosote and camphor (20 per cent.) in a palmitin base and the most usual strength is 10 per cent. The formula

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℞.

Sodii Chlorid.	gr. 4
Aq. Destillat.	℥ 400
Dissolve, filter and add Hydrarg. Perchlorid	gr 5

Dose. 8–10 minims, containing gr. $\frac{1}{10}$–$\frac{1}{8}$ of perchloride of mercury

The insoluble preparations have the great advantage that a single dose will usually suffice for a week's treatment, though probably the effect is not so rapid as that of the soluble preparation. Another advantage is that the effect is maintained for a much longer time after the course of injections has ceased, since the mercury continues to be absorbed from the site of the injection for some weeks. From another point of view this is a slight disadvantage, since a patient cannot be watched so closely for signs of intolerance. Thus, an overdose of a soluble preparation would rapidly produce symptoms and give timely warning not to repeat the dose, while in the case of an insoluble preparation the symptoms might continue long after suspending treatment, owing to the continued absorption of mercury from the site of the injection.

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used largely in the Navy is similar but contains chlorbutol and its strength is 20 per cent. The salicylate is most conveniently suspended in liquid paraffin. The usual weekly dose of calomel varies from ½ to 1 gr that of mercury ½ to 1½ gr and that of the salicylate from 1 to 2 gr

As to the choice between these preparations, it is difficult. Gennerich and others prefer calomel for its quicker and more intensive effect but, after trying this preparation for some time I came to the conclusion that, for the combined arsenical and mercurial treatment, metallic mercury has many advantages. It is more easily tolerated, both locally and generally and although its effect is not so rapid as that of calomel it is more lasting After all, if one employs the newer arsenical preparations one does not look to the mercury for rapidity of effect. The rôle of mercury *in the combined treatment would appear* to be rather that of an agent which can safely be retained in the circulation and by which the effect of the arsenical preparation is maintained for long after the latter has been excreted.

TECHNIQUE OF INTRAMUSCULAR INJECTIONS

The instruments required are an all glass syringe, or one with a glass barrel of 20 40 or 60 minims capacity This is armed with a needle which is 1¼ inches long and may be of steel or platino-iridium. Whichever type of needle is chosen it should invariably be tested before use. Steel needles may gradually corrode internally and snap, while the weak spot in a platino-iridium needle is at the junction of the stem with the base. The syringe can be sterilised by boiling *and the needles*, either by immersion in oil at 100 C. or in spirit the latter will be found more convenient in private practice. If the syringe is used only for mercurial injections, and the remnants of the last injection are left in the barrel, it need be sterilised only once. Thereafter the mercurial preparation and its base will maintain its sterility Soluble preparations are, naturally ready for

use when the salt has been dissolved. A convenient strength is 1 or 2 per cent.

As mentioned, the salicylate of mercury is most conveniently suspended in paraffin. The dose, say 1½ grains is weighed out, rubbed up in 10–15 minims of paraffin, and drawn into the syringe. As an alternative, a stock emulsion of 10 per cent. strength can be made up and drawn upon as required. It can be sterilised by heat, and is ready for use after vigorous shaking.

In the case of the other insoluble preparations, these are usually supplied by the makers already mixed with the base. For institutional work it is convenient to keep the preparation in a wide-mouthed bottle which is shallow enough to allow of the syringe easily reaching the bottom. Before use it is necessary to warm the preparation to blood heat, which can be done in a steriliser and to stir it up well with a glass rod, or shake it vigorously as the heavy mercury or calomel, tends to settle to the bottom. When sufficiently fluid and mixed, the cream is drawn into the syringe before the needle is fitted. In private practices where mercurial injections are given only occasionally it is more convenient to have the mercury supplied in ampoules of about 1 c.c. capacity. This arrangement is perhaps more wasteful of the preparation, but avoids the necessity of energetic mixing as a preliminary to the injection. The ampoule is warmed to blood heat, its neck broken off, and the dose drawn into the syringe. In this case it is necessary to aspirate the cream through the needle, so that it requires warming until it is more fluid than when contained in a pot.

The needle should not be inserted into the tissues with its point, or the outside of its stem, soiled with the mercurial preparation, as this is apt to leave a track in the superficial tissues which is very irritating. Any cream on the point and stem of the needle should, therefore, be wiped away with a small square of carbolised bandage, which will leave no cotton fibres sticking to the needle.

The needle may be introduced into the tissues with the syringe attached, or separately On the whole, the latter seems to be the more convenient plan. The site chosen may be the lumbar muscles or the gluteal and the latter appear to be preferable from many points of view Any muscular spot will serve which is between the crest of the ilium and a line drawn horizontally at the junction of the folds of the buttocks, but the outer half of this region is preferable if not required for other purposes such as the intramuscular injection of 914 The needle is grasped by its base between finger and thumb, as if it were a dart, and thrust into the muscles to its full length at right angles to the skin. If the point touches bone, the needle is withdrawn about two millimetres. The base of the needle is inspected to see if blood is oozing from it, in which event it is partly withdrawn and thrust in again in a slightly different direction. As soon as it is seen that no blood is oozing from the base of the needle, the latter is grasped with index finger and thumb of the left hand in order to keep it steady the syringe is fitted and the dose slowly administered Before removing it, the needle should be rotated once or twice round its long axis After withdrawal of the needle, the site of the injection should be well massaged with a ball of cotton wool the size of a tennis ball, wrapped up in lint, in order to dissipate the dose in the tissues

The Side-effects of Mercury.—The chief side-effects which call for any notice in the mercurial therapy of syphilis are stomatitis and nephritis Colitis is also a toxic effect of mercurial preparations, but hardly ever gives trouble after the doses usually administered. The administration of mercury by the mouth is followed more frequently by digestive and intestinal disturbances and may require the inclusion of a little opium in the prescription.

Nephritis is comparatively rarely seen during the administration of mercury when this is administered in such doses as are usual in the treatment of syphilis. As a matter of

fact, in connection with another disease I have been responsible for the administration of many thousands of doses of mercurial preparations which were about ten times as large as those given individually to cases of syphilis and, even in those cases, very rarely witnessed any signs of kidney disturbance.

It is important to remember however that, in cases where the kidneys are already diseased, it is necessary to watch the urine carefully to see that the mercury is not adding to the irritation. Again, it is possible that, as contended by Wechselmann, mercury may render the kidneys more susceptible to the toxic effect of any arsenical preparations which may be used in combination, and, altogether the regular examination of the urine is a necessary part of the routine of anti-syphilitic treatment.

Stomatitis is the chief bugbear of mercurial therapy chiefly so because it may necessitate interruption of the course before sufficient mercury has been administered. Even with the intramuscular injection of insoluble preparations, however in which, on account of the storing up of the mercury in the tissues, stomatitis is not so controllable as under the injection of the soluble preparations, it is extremely rarely that a case of very severe stomatitis occurs at the present time. If the patient's mouth is not watched, however and the administration of mercury is continued in full doses after the mouth and gums have become sore, the breath becomes foul, there is a continual metallic taste in the mouth, with distressing salivation, while the tongue and gums become greatly swollen and ulcerated, and the teeth loose. In a case which is properly watched, the mercury is considerably reduced or stopped altogether as soon as the mouth becomes mildly irritated.

The prevention and treatment of stomatitis are important because, as mentioned, the onset of stomatitis interferes with the mercurial administration. Before commencing treatment the patient should have his teeth scaled and

receive any other dental attention required. Preliminary scaling is always a great help apart from any other measure. A mouthwash is valuable and the patient should be advised to clean his teeth night and morning Prescriptions for suitable mouth washes and dentrifices will be found in Appendix IV

If in spite of these measures the gums begin to feel sore the teeth ache or the patient dribbles saliva easily the mercury should be interrupted or in milder cases, reduced by a half and the following procedure is valuable. Wash out the mouth frequently with peroxide of hydrogen, and after each washing rub the gums and teeth thoroughly with a swab of lint soaked in collosol argentum, or paint them with the solution recommended on p 348 for papillomata.

There is no doubt that without the sulphur water which forms a part of the treatment at Aachen, the huge doses of mercury given there by inunction could not be administered with impunity Whether the sulphur saves the spirochætes as well as the tissues from the action of the mercury is a matter which is not settled. It can at any rate be regarded as a valuable antidote in cases of mercurial poisoning Sulphur can also be administered in thirty grain doses suspended in water

Malaise and loss of weight are apt to manifest themselves when mercury is pushed too energetically in particular cases and for this reason it is always valuable to weigh a patient who is undergoing mercurial treatment.

Dermatoses, such as urticaria, erythema, and even exfoliative dermatitis, also occur but are very rare It is possible that, in cases of dermatitis which follow the combined mercurial and arsenical treatment of the present day the mercury has assisted in precipitating the condition. Such cases are now attributed to the arsenical preparation, but it should be noted that they did occur though much less frequently before the advent of the arsenical preparations

It will be seen that the side-effects of mercury are similar in many details to those of the arsenical preparations, so that the old routine examination of patients undergoing anti-syphilitic treatment has required very little alteration. As formerly we weigh the patient examine his mouth, test his urine, and generally scrutinise him, to see that he is not suffering from malaise as a result of the treatment. The chief innovation in the modern supervision of the patient is the close scrutiny of the skin, in order to detect at once the onset of any dermatosis before any more treatment is administered.

IODINE

The part which iodine plays in the cure of syphilis is not clear though its value is undoubted. It is fairly certain that it does not act directly on the spirochæta pallida, since in primary and secondary syphilis it does not cause these parasites to disappear from the various lesions nor does it influence the Wassermann reaction. As is well known, it has a beneficial effect in chronic inflammatory lesions of any kind by causing the disappearance of new formed connective tissue, and it is very probable that its value in the treatment of syphilis depends on this action. Syphilitic processes are always associated with considerable formation of new connective tissue, and it is important to remove this for two reasons (1) because in the early stages such tissue generally encloses numbers of spirochætes and makes them inaccessible to anti-spirochætal remedies circulating in the blood, and (2) because in the later stages of syphilis the new formed connective tissue is so excessive that it may cause considerable damage to surrounding structures. On this hypothesis, the chief rôle of iodine in the early stages would be to make the specific spirochætes accessible to the remedies introduced for their destruction and in the later stages, perhaps in addition to this to assist nature in the removal of what is, in effect, a tumour.

Many preparations of iodine have been devised for

where this is practised the patient seems often to make more rapid strides in the interval when taking iodide than during the course of mercury and arsenic, though his progress would be poor enough if the iodide had not been preceded by the metallic remedies

In all cases it is preferable to administer iodides in short rather intensive courses than in small doses spread over a long period A course lasting two weeks commencing with 5 or 10 grs and increasing to 20 or 30 grs. three times a day will probably meet most cases.

The General Management of Syphilis

Prevention.—It goes without saying that an effective barrier between the virus and the skin or mucous surface is the best prophylactic of syphilis The best barrier is, of course, air next to that an intact rubber covering and lastly an antiseptic ointment over the parts.

It is not wise to trust entirely to such a barrier as one of the two last mentioned. The part which has been in contact with the virus should be steeped or bathed in an antiseptic lotion, such as perchloride or biniodide of mercury 1/1 000 *This usually suffices for hands. If*, however there is any reason to fear that the contaminated part has been abraded and this should always be assumed in the case of the penis, an ointment should be rubbed in. The best known ointment for this purpose is that with which Metchnikoff prevented syphilis after experimental inoculation of a man. It is not sufficient to smear the ointment over the part it should be rubbed in energetically for about ten minutes. The formula of Metchnikoff's ointment is as follows

Calomel	33
Lanoline	100
Vaseline	10

It is necessary that the above measures should be taken at the earliest possible moment and certainly not more than one hour after exposure as the spirochæte rapidly

travels into the tissues, where it becomes inaccessible to antiseptics.

Treatment.—Of the remedies which have been discussed above, one would at present choose for the treatment of syphilis, "606" intravenously or "914" intramuscularly mercury; and iodide of potassium.

Although a few workers would content themselves with administration of an arsenical preparation, there is little doubt that much more is accomplished by the employment of a combined therapy containing all three remedies.

As to the amount of each of these remedies which should be administered to any one case of syphilis, it is naturally impossible to say definitely at present. Undoubtedly many cases have apparently been cured by comparatively short courses of treatment, if we may judge by the number of undoubted cases of reinfection which have been recorded since the introduction of "606" on the other hand, others have relapsed after most intensive and repeated courses. It is impossible, therefore, to tell any given patient beforehand exactly how long he will be under treatment, or how many injections he will require. All we can say is that we propose to administer as a *minimum* the amount which we have found by experience to give a very high percentage of apparent cures in that stage of the disease in which he happens to be at the moment. After this the question of subsequent treatment will be determined by the behaviour of the Wassermann reaction during and at the end of the minimal course, and by subsequent observation and tests spread out over a considerable period. The present system of treatment is based on the results of a comparatively few years. It may be that later observation as to incidence of tabes and general paresis will force a considerably more prolonged treatment on us. As to this, there is no evidence at present but when the time does arrive for this point to be determined, it will be advisable to ascertain the amount of treatment originally administered to every such case before pro-

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Of the two lines of arsenical treatment shown here as in other cases, one would prefer the intramuscular

In primary cases where the Wassermann reaction has already become positive, or was found to be positive a week after the first injection, it would be wise to allow an interval of 3–4 weeks after the above course and then administer a follow up course of 3–4 injections at 7–10-day intervals, say 0·3 0·4 0·4 and 0·5 grm. "606 or four intramuscular injections of 0·6 grm. 914 with, in either case, one grain of mercury each week. During the interval potassium iodide should be given for two weeks, increasing the dose gradually from ten to twenty grains, three times a day If the Wassermann reaction is still positive or doubtful at the end of this 100–110-day course, another similar course is indicated after an interval of about eight weeks.

In all cases of primary sore it is of the greatest importance to apply local treatment to destroy the spirochaete *in situ*. It may be possible to remove the sore by circumcision, or to destroy it with a cautery Failing this, the sore may be injected with 0·2 grm. Hectine, as supplied in ampoules ready for use. An ointment made up with 914 to 8 per cent. is also a useful application, as also Metchnikoff's cream, mentioned above. If an ointment is used, it is a good plan to tell the patient to try to rub the sore away with it. He should be impressed with the fact that rapid healing is not nearly so important as reaching the depths of the sore with the anti-spirochetal agent.

For early secondary cases, the course suggested for medium and late primary cases would probably suffice in most cases, particularly if the Wassermann reaction were negative by the seventh injection but a more certain plan is to allow an interval of three or four weeks and then give another course of three or four "606 injections at 7–10-day intervals. If the Wassermann reaction were positive at the end of 100–110 days from the commencement, it would be advisable to repeat the

nouncing judgment on the modern arsenical therapy If, for example, in 1920–25 there is a large incidence of para-syphilis amongst cases treated with 606 in 1910 and 1911 it may well be because of the very inadequate amounts of these remedies which were administered then.

Most patients press for an answer to their almost invariable question as to how long they will be before they are cured and it is unwise to answer on any but the above lines. If all would follow this principle, the general public would be educated not to give up the treatment as soon as the clinical symptoms had disappeared or to wander from one doctor to another seeking the one who promised them the shortest treatment.

The programme which is laid down depends largely on the stage of the disease, and one may conveniently consider the treatment of (*a*) syphilis where there is no obvious disease of the central nervous system, (*b*) syphilis of the central nervous system (*c*) syphilis of pregnant women, and (*d*) congenital syphilis.

Taking these in the order named, the treatment of syphilis without obvious symptoms of central nervous disease depends much on the age of the infection It may be divided into the treatment of primary cases with a negative Wassermann reaction, of primary cases with a positive Wassermann reaction, early secondary cases, and older syphilis.

For early primary cases the minimum course of treatment which I have prescribed for some time is as follows

Days of Treatment.	606 Intravenously grammes.	or	914 Intramuscularly grammes.	with	Mercury Intramuscularly grains
1	0·3	or	0 45	with	1
8	0·3		0 45	"	1
15	0·3		0·6	"	1
22	—		—		1
29	0 4		0·6		1
36	0·4		0 6	"	1
43	—		—	"	1
50	0·4		0 6		1
57	0 5		0·6	"	—

is strongly positive. It is sometimes advised in such cases that one should leave well alone for fear of stirring up mischief, and, in support of this, instances are recorded in which the institution of anti-syphilitic treatment precipitated grave disease of the central nervous system. But in such a case as that last mentioned, could the withholding of treatment have been described as leaving well alone? One would surely say that a patient suffering from such a degree of syphilis of the central nervous system that a temporary exacerbation of the process precipitated symptoms would be one for whom anti-syphilitic treatment was imperative. The fact that the institution of treatment was followed by severe symptoms may argue against the manner in which the treatment was instituted, but hardly against the general principle of its necessity. The fact that a patient shows no active outward signs of syphilis, or that he feels well, is no indication that the Spirochæta pallida is not at work in parts of him which cannot be viewed with the naked eye, the coats of his arteries for instance. Again, it is well known that the Spirochæta pallida tends very strongly to become active in damaged and overworked parts, and one may regard a patient who harbours spirochætes as one with a lower breaking strain than normal. Specific treatment is indicated therefore, if only as an insurance against the recrudescence of the parasite in times of stress.

It may be argued that we do not know for certain that the Wassermann reaction indicates that the Spirochæta pallida is active in the patient. This may be; but while we have a great amount of evidence that it does so indicate general spirochætal activity, we have as yet no evidence that a positive Wassermann reaction coincides with complete latency or death of spirochætes. We may have theories on the subject, but until we possess instruments which will enable us to search microscopically the innermost recesses of every patient's anatomy, the coats of his arteries, his bone-marrow, spleen, etc., we are not justified

whole 100–110-day course after an interval of about eight weeks

In later cases of syphilis with active symptoms, after a preliminary course of sixty days, one would prescribe a series of short *courses of four injections* each, with intervals of about eight weeks between courses, and potassium iodide for two weeks in each interval. In these cases, where the Wassermann reaction is strongly positive on commencing treatment, as is usually the case it very frequently remains positive *for many months*. Long before this, all clinical symptoms have disappeared but I think it wise to continue treatment at intervals for as long as it remains positive, though after three courses the intervals may gradually be prolonged to six months.

There remains for consideration the *difficult* case of the patient who having an old history of syphilis, is found *to have a positive Wassermann reaction*, though he has no *clinical symptoms* of syphilis. *Such cases may be divided* in the first instance into two categories (1) those where the patient is suffering from some disease which does not appear from the clinical evidence to be syphilitic and (2) where the patient is apparently quite well. In cases where there is *intercurrent disease*, I would *advise an anti-syphilitic* treatment, on the principle that the spirochæta pallida always attacks the weakened spot. If the intercurrent disease is a visceral *one*, the *administration* must be cautious, especially at first, and intramuscular injections are preferable because of their milder constitutional effect. In these cases *a series of courses*, each *consisting of* 8–10 bi weekly intramuscular injections of 0·2–0·3 grm. *914* (or alternate intramuscular and intravenous injections) and six weekly injections of *mercurial cream*, with intervals of six to eight weeks between the courses, and potassium iodide for two weeks in each interval would generally be appropriate.

Lastly cases where the patient is apparently *well*, *where* the history is an old one, but the Wassermann reaction

The mercury is prescribed in the form of a pill, or as tabloids of Hydrarg c. Cret. gr i-ii with or without Pulv Ipecac. Co. thrice daily A week's rest is allowed at the end of every six weeks and three to four weeks at the end of twenty weeks.

Observation of the patient after suspension of treatment is of the greatest importance, especially in early cases, and the longer the period of observation is prolonged, the safer the patient. Before deciding to suspend treatment the cerebro-spinal fluid should be examined, as well as the blood, and in the event of either proving pathological, the treatment should be renewed after a suitable interval. Subsequently during the first year the patient should be examined clinically at intervals of not more than a month, while his blood is tested at intervals of not more than three months. At the end of a year from suspension of treatment a small injection of "606" (0·3 grm.) or of "914" (0·45 grm.) should be given, and the blood-serum tested, if possible, 2, 4, 7, 14, and 21 days afterwards. If this is not practicable, one would choose the seventh day after the provocative injection as the most likely to catch a provoked reaction. In addition to the blood test, it is important after a provocative injection to test the cerebro-spinal fluid, and the test should be carried out a week after the injection.

During the second year the periods of observation may be lengthened, and a test every six months should suffice.

The question arises, after what interval of freedom from all signs would one be justified in giving the patient a clean bill of health, and allowing him to marry, for instance? In view of the fact that the arsenical treatment of syphilis and the Wassermann test are of such recent origin, it is impossible to answer such a question with certainty at the present moment. Gennerich believes that, after such a course as mentioned above for these cases, if a primary case remains negative to all tests for a year he is safe, but a secondary case must be observed for two years, while to later cases no guarantee as to recurrences can be given.

in asserting that, in old cases of syphilis, a positive Wassermann reaction unaccompanied by clinical symptoms is a sign of no moment. Perhaps many years hence statistics may prove that the expectation of life in a patient who has shown no symptoms after the early outbreak, but gives a positive Wassermann reaction throughout the remainder of his life, is as great as that of one with a negative reaction, but the evidence at present would not lead one to stake on such a possibility. In deciding the question of treatment in such cases as those under discussion, it is necessary to keep these facts in mind and then be ruled by circumstances. If the patient has several years of active life before him during which he may be subjected to abnormal strains, I would certainly advise treatment. If he has passed this stage in life, treatment may not be a matter of any great moment. Beyond this, it would be impossible to lay down any hard-and fast rules.

As to the kind of treatment which should be instituted in such cases, probably the most appropriate for the average would be a course of five or six weekly injections of 606 or 914 commencing with 0·3 grm. and increasing gradually to 0·5 grm. with weekly injections of mercurial cream. This should be repeated at intervals of six to eight weeks for two or three courses, after which the intervals can be lengthened by three or four weeks each time, until the patient is receiving two courses a year. Potassium iodide, in doses of 5–10 grains increasing to 15–20 grains three times a day should be given for two weeks in each interval. Such treatment must be prolonged over a number of years.

It often happens that it is impracticable to administer a course lasting more than 60 or perhaps 110 days. Or the patient is going to be so situated that he cannot be so closely observed afterwards as is desirable. In such cases, which are particularly numerous now if there is any chance of the patient following the advice, I always recommend him to take mercury by the mouth for a year

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Gennerich instances a number of healthy marriages in comparatively recent infections which have followed his advice on these principles.

Further than this, the only thing one can say is that the best treated patient should wait for at least two years, and the longer after this that he waits, the better guarantee he has of safety in marriage. The risk of transmission is gradually reduced after the second year in any case, and is very uncommon after the fifth year. Judging from the rapid effect of the modern treatment on accessible spirochætes one would say that a patient could not transmit syphilis whilst actually undergoing treatment.

Syphilis of the Central Nervous System.—Although workers differ in the detail of their treatment of syphilis of the central nervous system there is general agreement on two main principles: (1) to start treatment with small doses in order not to produce too intense a focal reaction and (2) to give very much more of the arsenical preparation than is usually considered necessary for ordinary cases of syphilis. One would add a counsel of the greatest importance: that is never to delay the treatment a day longer than is necessary. It should not take days or weeks to come to a conclusion as to the syphilitic origin of the malady. In that time the disease may have damaged the nervous tissues beyond repair.

In syphilis of the supporting structures of the brain and spinal cord—syphilitic meningitis, including neurorecurrences, meningo-myelitis, myelitis and gumma—many authors believe in a preliminary course of mercurial injections or inunctions, with iodides, lasting for ten to fourteen days, before commencing with very small doses of arsenical preparations. In choosing the latter on the same principle, some commence with that which is least likely to provoke a reaction, viz. 914.

In tabes, on the other hand, the inclination is to withhold mercury during the administration of the arsenical preparation, with which the treatment is commenced. In

tabes it is generally agreed that treatment should continue in spite of its provoking reaction in the form of crises.

After successfully treating numbers of cases of meningitis and meningo-myelitis, I am not inclined to attach any great importance to the preliminary course of mercury. In fact, in one case where this was tried, the patient, who was suffering from meningitis, became temporarily insane during the preliminary course of inunctions. Treatment with intramuscular injections of "914" 0·2 grm. on alternate days, was instituted, and he was rational again the day after the first injection of "914."

It is important, however, to commence with small doses in all cases, and I have found that an intramuscular injection of 0·1 grm. "914" is always well tolerated. This is repeated in three or four days, and the dose is then increased to 0·3 grm. As soon as it is seen that the arsenical preparation is well tolerated in these doses, the course is continued with bi-weekly injections of 0·3 grm. "606" intravenously until a total of 4 to 5 grm. has been administered. Or instead of giving two intravenous injections a week, one intramuscular of "914" and one intravenous of "606" may be given. Mercury is administered in weekly injections throughout the course. Such a course will often result in a reduction of cells in the cerebro-spinal fluid from 700 or more per c.mm. to 80 or less, and the Wassermann reaction from a strong positive in the smallest amount of fluid used to a weak positive in the largest (see p. 281). At the end of the first course, the patient is treated for two weeks with potassium iodide in doses which increase from 5–10 grains three times a day to 20–30 grains three times a day and then rests eight to ten weeks before resuming treatment with mercury and arsenic, as in the first course. A third course should be administered in any case, and a fourth may be necessary. The treatment should be controlled by examinations of the cerebro-spinal fluid, which are carried out at the

beginning and end of every course. It should be continued until the cells are below 10 per c.mm. there is no excess of globulin and the Wassermann reaction is negative with the largest amount of fluid. Provided that treatment was begun promptly after the first appearance of symptoms, subjective symptoms improve fairly rapidly Too rapidly in fact, from one point of view since the patient is very apt to grow tired of the treatment after his symptoms have disappeared and to give it up before his cerebro-spinal fluid has become normal.

Cases of tabes can be treated on similar lines to the above. The treatment at first may appear to cause some increase of symptoms more frequent crises, bladder disturbances and so on, but the injections should be continued in spite of these

A patient suffering from tabes will naturally ask what the treatment offers him in the way of cure. The answer depends largely on the stage he has reached, since much more can be promised in the very early stages than in the later In the first place, he should be told that if he does not intend to go through with the treatment it would be better not to undertake it at all, since more harm than good is done by an insufficient treatment. As an example of the improvement which may be obtained I have seen a patient who could not walk without support, and could not stand on a narrower base than eighteen inches between his feet, able to walk alone and regain control over his bladder and rectum after a series of courses of treatment with 606 and 914 and mercury He received in all 8 6 grm. 606 and 6 3 grm. 914 in a total of 29 intravenous injections and 19 intramuscular

The Intraspinal Treatment of Syphilis of the Central Nervous System.—The difficulty of reaching the parenchyma of the central nervous system with arsenical preparations introduced into the blood stream induced Swift and Ellis to test the effect of injecting into the spinal canal the serum of the patient shortly after he had received an intravenous

injection of "606. Experimentally they showed that such serum still showed anti-spirochetal properties an hour after the injection. As at present practised, the technique is as follows. Half an hour after an injection the patient is bled under aseptic conditions to an amount which will yield 10 c.c. serum—say to 30 c.c. blood. The serum is separated, heated at 56 C. for forty five minutes, and introduced into the spinal canal after drawing off about 15 c.c. of spinal fluid. The patient rests for two days, and the injection is repeated about once every three weeks.

Gennerich favours the direct introduction of "914 into the spinal canal. From 4 to 8 c.c. of a 1/2 000 solution (0 15 grm. in 300 c.c. water) are mixed in 12 to 15 c.c. of the cerebro-spinal fluid, which has been allowed to run into a funnel connected with the intraspinal canula, and the mixture is then allowed to flow slowly back by gravity into the spinal canal. The patient rests for two days, and injections are repeated not oftener than every two to three weeks. Other workers inject serum in which "914 has been dissolved and which has been heated at 56° C. for forty minutes. The initial dose is considerably less than that recommended by Gennerich, being 0·05 mgrm., gradually increased to 0·2 or 0·3 mgrm. It is certainly wiser to commence with a small dose, such as 0 05 mgrm. and not to exceed 0 5 mgrm., as larger doses are apt to be followed by bladder disturbances, etc., due to irritation of the lower spinal segments.

Following the recommendation of Byrnes, various workers have tried the injection of mercurialised serum. As practised by Wolfsohn, who has slightly modified the original technique, the procedure is as follows

(1) The patient receives full doses of mercury by inunction for a week.

(2) An amount of blood which is sufficient to yield 18–20 c.c. of serum (about 40 c.c. of blood) is drawn off, centrifugalised, placed in a refrigerator for 18–24 hours,

again centrifugalised for 15–20 minutes, and the serum pipetted off

(3) To this serum is added 1 c.c. of a solution containing $\frac{1}{10}$ of a grain of mercuric chloride in distilled water

(4) The prepared serum which should be perfectly clear is heated at 56° C. for half an hour

(5) Spinal fluid is removed by lumbar puncture until its pressure reads about 80 mm. when the prepared serum is slowly administered by gravity at body temperature. The patient is put to bed with the foot of the bed elevated for four hours

On an average, five injections are administered at intervals of one to five weeks. Wolfsohn concludes with regard to the method that it is very efficient in syphilis of the central nervous system especially in tabes with severe lightning pains. Also, it has the advantage of stability and is perfectly safe, provided that care is taken not to introduce hæmoglobin with the serum.

Excellent results have been claimed for the intraspinal method of treatment, especially that by salvarsanised serum, but it must be said that it is much more troublesome than the ordinary intravenous or intramuscular. It may cause considerable discomfort to the patient in the form of bladder disturbances, headache, etc. so that, since the treatment has to be prolonged with the patient's consent, the intraspinal method can hardly be regarded as one for routine use. In my own hands it has not produced more rapid results than the intramuscular and intravenous methods. On the whole, then, one would reserve it for cases in which the latter had failed.

The Treatment of Syphilitic Pregnant Women.—Excellent results have followed the treatment with the newer arsenical remedies of syphilitic women who are pregnant. Naturally the best are obtained when the treatment is commenced as early as possible. The chief dangers are abortion and nephritis, but these can be avoided by care as to dosage and a close watch on the urine. The com

mencing dose should be 0·[illegible] grm. "606" if the intravenous method is chosen, and this is increased to 0·3 grm. after a week. Thereafter provided that no signs of intolerance are shown, the course is completed with six more intravenous injections of 0·3 grm. The course is repeated at the end of six or eight weeks, and treatment maintained on these lines until about the eighth month of pregnancy. It is inadvisable to approach the end of pregnancy closer than this, on account of the risk of post partum hæmorrhage. The intramuscular method is one which commends itself for the treatment of pregnant women on account of the mildness of the general reaction to which it gives rise. Treatment should be completed after pregnancy on the same lines as in ordinary cases.

The Treatment of Syphilitic Infants.—The combined treatment with mercury and one of the arsenical preparations has undoubtedly given the best results. The dosage of the arsenical preparation depends on the age and condition of the patient. In very young infants the commencing dose may be 0·01 grm. "606" or 0·015 grm. "914," the former being given intravenously and the latter intramuscularly. The dose of "606" or "914" is repeated at weekly intervals and gradually increased to 0·05 or even 0·1, giving six to eight in each course. The treatment should be repeated every six to eight weeks, the dose being increased as the child becomes older. Mercurial treatment should also be administered at the same time, and this may take one of many forms. By the mouth, Liq. Hydrarg. Perchlor. ♏x increased to ♏xxx thrice daily in the milk; calomel in doses of to ½ grain thrice daily; grey powder in doses to ¼ to ½ grain thrice daily increasing to 1 grain thrice daily at a year old. Mercury by the mouth may cause diarrhœa: this can be avoided by combining it with Pulv. Cret. Aromat. or with Pulv. Ipecac. Co., the latter in doses of [illegible] grain increasing to ½ grain at twelve months. Injections into the muscles of soluble and insoluble preparations of mercury may be preferred.

Mercurial cream in doses of $\frac{1}{4}$ grain or the salicylate suspended in paraffin in doses of $\frac{1}{3}$ grain may be given weekly during the period of the arsenical injections, or mercury perchloride in doses of $\frac{1}{16}$ to $\frac{1}{12}$ grain twice or three times a week. Inunctions are apt to cause dermatitis. When employed, a piece of the ointment the size of a pea is rubbed over the chest and abdomen daily It may conveniently be applied under the binder or as recommended by Whitla for emaciated infants, the binder may be soaked in cod liver oil and the mercurial ointment applied to it. Between courses it is useful to administer Syrup Ferri Iodidi for its tonic effect and that of the iodine. The treatment should be prolonged over two years, as these patients correspond to the more advanced types of acquired syphilis, and it is important to do everything possible to prevent later manifestations.

The treatment of children and adults suffering from congenital syphilis should be carried out on the same principles as laid down for adults in the late stages of syphilis the dosage being calculated on age, weight, and condition. Calculated by weight, generally speaking a dose of 0·005 grm. of 606 per kilogramme is safe.

CHAPTER XXII

THE PREVENTION OF VENEREAL DISEASES

The prevention of venereal diseases is a task which should concern every citizen of the Empire. For these diseases will be equalled by none in their weakening effect on the national efficiency unless they are combated more generally and more energetically than at present.

An attack of venereal disease always leaves the sufferer potentially and very often actually a weakened member of the community Admittedly a substantial proportion of those who contract these diseases recover without apparent ill-effect but even in these cases the actual attack has levied its toll by temporarily reducing the productive power of its victim. On the other hand, a large proportion of sufferers from venereal disease are left permanently damaged. Even amongst those who subsequently show no active signs of the disease many can be found whose continual fear of its return has become a mental obsession which must interfere seriously with their efficiency But even if these comparatively minor degrees of inefficiency are excluded we are left with an important proportion in those who are never afterwards completely free from active signs r are liable to a return of it as the result of abnormal stress or strain, or of local injury For venereal diseases re notorious for their tendency to recur in the spot which is weakened by over-work or injury In short if one could compare the total contribution to the common good of any thousand non venereal persons with that of any thousand who had at some time or other contracted venereal disease over a period of forty years, the advantage in favour of the former would be enormous both in the total

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virus is planted and its delicacy but a woman is infected almost the first time she has intercourse with a man suffering from venereal disease. A young woman of this class is far more dangerous than a professional prostitute. She probably suffers little or no inconvenience from the disease, and may even be ignorant of the fact that she is suffering from it in any case she is totally ignorant of the means of preventing her infection from passing to others and the fact that she is not a professional engenders in her paramour a false confidence in her bodily purity There is little wonder that two-thirds of all venereal infection amongst British soldiers is due to intercourse with these "amateurs."

The question arises, What can be done to combat the peril which faces us as a community from the wide spread of venereal diseases? Where can the chain of infection be broken?

At the present time there are various societies which are directly or indirectly interested in the combating of venereal diseases, and the solutions of the problem which they offer differ with the ideals of the individuals composing them.

One may divide those who are attempting to combat venereal diseases into two main classes those who consider the combating of venereal disease the main object and the betterment of moral conduct a means to that end, but only a subsidiary means; and those who consider the betterment of moral conduct the main object and the reduction of venereal disease merely an inducement to that end. In the main the first party's programme consists in lectures on the virtues of continence and disinfectant measures in case of exposure to infection; that of the second party consists in lectures on the virtues of continence and a careful watch on the activities of the first party lest the latter should promote measures which in their opinion would act as an inducement to vice by conveying the suggestion that promiscuous sexual intercourse is to be expected of every man and can safely be indulged in by

output of work and of healthy children to carry on the work of their fathers.

To those who realise the ravages which venereal disease can cause, the misery which it can inflict on individuals, the slaughter of infants, born and unborn, the crippling of children who are at least entitled to a fair start in life, the prospect after the present war is nothing less than appalling It is a well known fact that every war is followed by a great increase in venereal disease in the community and the reason is not far to seek. The Army returns home, and its members at once begin to celebrate their relief from the toils and dangers of the past campaign by having what is commonly called a good time which includes a due proportion of promiscuous sexual intercourse. If such has happened in the past, when the numbers involved were comparatively insignificant what must be the result when the present huge army returns and is demobilised? Does any sane person imagine that the sexual indulgence and resulting venereal disease will promise to be in appreciably less proportion than on previous occasions? On the contrary there are reasons for believing that it will be greater Previously the sources of danger largely existed in professional prostitutes, many of whom knew how to prevent the transmission of infection they had at any rate, become no longer contagious from the point of view of syphilis and were only intermittently dangerous from that of gonorrhœa. Now a new source of infection has become prominent. Thousands of young women have left their homes during the present war to take part in war work and have thereby been removed from powerful moral restraints. They have learnt how to overcome that incentive to moral restraint in women—the risk of conception—and have celebrated their emancipation by considerable sexual indulgence. The inevitable result has followed. A man may indulge in promiscuous sexual intercourse with infected women forty or fifty times without becoming infected thanks to the exposed position in which the

Schäffer and Steinschneider found *inter alia*, that gonococci are killed by five minutes contact with—

1/1 000 silver nitrate
1/2,000 argentamin
1/4 000 argonin
1/2 000 oxycyanide of mercury

and in ten minutes by—

1/4 000 silver nitrate and
1/100 protargol

No growth can be obtained after admixture of 30 per cent. calomel ointment with gonorrhœal pus for five minutes, whether the mixture is intra or extra urethral. With regard to the Sp pallida, Noguchi found that cultures are killed at once by contact with 1/1 000 permanganate of potassium, or 1/5 000 p rchloride of m rcury The effect of calomel is supported by the classical experiment of Metchnikoff on Maisonneuve, who was inoculated with syphilitic virus at the same time as four macaques. Maisonneuve and one macaque were energetically rubbed with calomel ointment an hour after the inoculation n_ither developed any sign of syphilis Another macaque rubbed twenty hours afterwards and two not rubbed at all developed typical syphilitic _hancres. Neisser showed that plain washing with soap and water after inoculation was effective against syphilitic infection in experimental animals. Clinically twenty four hours after dressing a ripe chancre with 30 per cent calomel ointment it is unusual to find spirochætes, though these abounded previously in the serum exudate.

The above facts have been applied to the combating of venereal disease by armies and navies all over the world. The details of the various methods employed by some of them will be discussed later but in the main, protection against syphilis has been sought by vigorous inunction of the genitals with calomel ointment, and against gonor rhœa by instillation of a silver preparation or of calomel

taking certain precautions. A certain mutual forbearance has resulted in agreement as to the line of action followed by each of these parties, and one can say that the second party is not now obstructing the disinfectant activities of the first so actively as was formerly the case It is not necessary here to offer any opinion as to the lines of policy pursued by each of these parties, since, in a book devoted to infectious diseases, it is justifiable to confine one s attention to the medical means by which the chain of infection can be broken

From the purely medical standpoint the breaking of the chain of infection and the ultimate extermination of venereal disease as far as gonorrhœa and syphilis are concerned is a simple matter The gonococcus and the Spirochæta pallida are two of the most delicate organisms in existence and therefore easily killed whilst still on the surface. The important point to remember is that both of them tend to penetrate pretty rapidly to the deeper tissues where they are immune to attack by simple means. The following illustrates the delicacy of these organisms from the laboratory point of view

RESISTANCE OF THE GONOCOCCUS TO ANTISEPTICS

Captain D Thomson working in the Rochester Row Laboratory with a culture medium on which gonococci grow as well as staphylococci on plain agar found that culture gonococci are killed in one minute by—

1/15 000 potassium permanganate solution but not by 1/20 000

1/1,250 potassium hydrate solution but not by 1/1 750

1/20 000 potassium permanganate in 1/2 500 potassium hydrate (unfortunately this solution does not keep).

It is right to note that Captain Thomson s results as regards potassium permanganate do not agree with those of Schäffer and Steinschneider who obtained several colonies after ten minutes' contact with 1/1 000 permanganate. Captain Thomson s results were however confirmed on repetition

frequent all-night passes was three times that of a neighbouring battalion where the passes were restricted to a few hours only

The treatment applied was (1) Thorough washing with soap and water (2) Washing with perchloride of mercury lotion. (3) Injection into the urethra of [illegible] per cent. protargol or 10 per cent. argyrol, retained for three minutes. Inunction of the parts with 33 per cent. calomel ointment. (5) Wrapping of the penis in toilet paper which was kept on for three hours.

EXPERIENCE OF THE U S ATLANTIC FLEET, 1909

Total number of men allowed ashore		70 454
Total number of men who reported exposure to venereal infection		21 116
Additional which failed to report but developed venereal disease		198
Total certain exposures to infection		21,314
Total which developed venereal disease		[illegible]
Total treated with some measure of disinfection		21 116
Probable number of these which would have developed venereal disease if no disinfection had been applied, at 2 per cent risk		422
Actual number of those who were disinfected who did develop venereal disease		401
Made up as follows		
Disinfected within eighteen hours of exposure	176	
Disinfected more than eighteen hours after exposure	223	
		401

Showing a very distinct advantage in favour of disinfection after exposure, even when the measures are taken, as appears mostly to have happened in these cases as long as eighteen hours afterwards.

The following table, which, with the Naval figures just quoted has been extracted from May's *Prevention of Venereal Disease* shows the experience at the U.S Naval Station, Norfolk, Virginia.

The Prevention of Venereal Disease O. May (Oxford Medical Press, 1918).

A Study of Venereal Prophylaxis in the Navy [illegible] (American Social Hygiene Association, New York 1917).

ointment into the urethra. The results are naturally not so easy to gauge as those of a laboratory experiment for obvious reasons For instance, it is difficult to state exactly the ratio of attacks to exposures owing to the impossibility of determining the number of the latter again, when disinfectants have been used the thoroughness with which they have been applied and the length of time which has elapsed since exposure to infection are very important variants when the results come to be measured. Allowing for all these causes of inaccuracy however it is easy to prove that early disinfection effects a very definite reduction in the incidence of venereal disease, as the following will show

The risk of infection in the case of men who have taken no precautions has been variously stated by different authorities as from 2 to 7 per cent. I have estimated it at not less than the former figure in the London District and 2 per cent. may fairly be taken as a basis for calculating the success of any measures of prevention. Bearing this in mind the following are instructive.

EXPERIENCE OF THE U S ARMY FRANCE

(1) Out of 2,420 consecutive men in a certain station who were treated within an hour and a quarter of exposure to venereal infection, only two subsequently developed venereal disease.

(2) Compulsory prophylaxis applied to a group of 3,000 men on return of each from pass and limitation of the pass to a few hours resulted in a reduction of the venereal admission ratio from 720 per 1,000 per annum to 10

(3) The importance of promptitude in application of early treatment is illustrated by the fact related by Lieut. Colonel H. Young Consulting Urologist to the American Expeditionary Force, that the venereal rate of one battalion which allowed

Subsequent to introduction of early treatment

June	7
July	–
August	6
September	4
October	5
November	4
December	9
Total for seven months	47

Provincial Barracks, 1917 Strength, 2,000 Early disinfection energetically practised by medical officer Total cases of venereal disease admitted to hospital, 13. Admission rate for the United Kingdom for the period of the war all troops, 48 per 1 000 per annum.

The experiences quoted above are supported by those of the Colonial troops who have displayed great energy in the application of early disinfection to the prevention of venereal disease, and it is clear that in it we have a means of exterminating venereal disease.

As to the actual methods employed by different workers, there is really very little difference though some are much more elaborate than others. Early in 1916 special ablution chambers were established in barracks and camps, where men could irrigate the anterior urethra with permanganate of potassium solution and inunct the genitals with calomel ointment on their return. Except in certain units they were not greatly used by men who were afraid of the publicity attached to their use. This system has been replaced by one in which disinfectant outfits can be obtained by men on application and used privately Each outfit for Imperial troops consists of an ounce of permanganate of potassium lotion 1/1,000 (found successful by Dr Archdall Reid) with which the man swabs the parts after urinating, using a small piece of cotton wool which is provided for the purpose. The third article of the outfit is

Total number who were certainly exposed to infection and received disinfectant treatment within a known number of hours 5 103

Probable number which would have become infected if no disinfectant measures had been taken, at per cent. risk 102

Actual number who developed venereal disease 81

These were made up as follows:

Disinfected within x/m hours of exposure.	Number exposed to infection.	Number who developed venereal disease.	Percentage of infections.
1	1 180	1	0·08
•	1 17		0·59
3	5..1	4	0·77
4	330		0·61
5	199	3	1 57
6	321	5	1 58
7	77	6	4 •7
8	390	16	4 ··
9	83	10	3·...
10	•14	11	5·14
More than 10	16	16	·40
Tot ls	5 103	81	1·53

This valuable table illustrates most strikingly the very great value of disinfectant measures undertaken within an hour or two of exposure It will be noted that in this station the risk of infection when no disinfection was applied or this was undertaken more than six hours after exposure was considerably higher than the 2 per cent which has been taken as the basis of these remarks

Experience in the British Army

Infections reported from a London Barracks month by month in 1916 for five months prior and seven months subsequent to the introduction of early treatment measures. Strength 2 001

Prior to introduction of early treatment

January	10
February	16
March	°0
April	19
May	12
Total for five months	7‾

Subsequent to introduction of early treatment

June	7
July	[illegible]
August	6
September	4
October	5
November	4
December	9
Total for seven months	4[illegible]

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a small tin tube one end of which is shaped like a nozzle. The tube is filled with 30 per cent. calomel cream in two consistencies, one semi fluid like ordinary cream, and the other stiffer To use the tube or E.T capsule as it is called a pin is pushed through the end of the nozzle and the semi fluid half is squeezed into the urethra, the stiffer portion which is squeezed out after the semi fluid is exhausted being used to innunct the genitals. The man is advised to pay particular attention to the mouth of the prepuce, corona glandis, frenum, and any abrasions or scratches there may be on the body of the penis, the pubes, or lower abdomen The E.T capsule was chosen in preference to the more elaborate Nargol outfit on account of its simplicity The "Nargol outfit consists of a tube of 3 per cent. protargol jelly for instillation into the urethra and a tube of calomel ointment, with directions for their use. The directions are simple enough but men seem to prefer the E.T capsule. I have recently incorporated 2 5 per cent thymol into the cream contained in the combined capsule following a suggestion which emanated from the American authorities. The following prescriptions will be found to provide suitable consistencies of cream.

For the semi fluid portion

Thymol		2·5
Calomel		30·0
Paraffin liq	1·0	
Paraffin Moll. alb	8·0 } to	100·0
Adeps Lanæ Hydros.	8·0	

For the stiffer portion

Thymol		2 5
Calomel		30·0
Paraffin Moll. alb	1·0 } to	100·0
Adeps Lanæ Hydros.	9·0	

The capsule used by the American Expeditionary Force is made of gelatine and split longitudinally at its pointed

end, so that the latter opens on squeezing It contains a cream of the following formula :

Calomel	33·3
Camphor	1·6
Acid. Carbolic	1·5
Lanoline	15·0
Adeps	50·0

The Imperial Army has contented itself with providing means for private disinfection by the man himself, but the Overseas Armies have supplemented this by the provision of centres at which men can be disinfected by trained attendants. The following is the procedure adopted at the Australian early-treatment centre in London

After the patient has urinated, the whole genitals are washed thoroughly with 1/2,000 Hydrarg Perchlor A small swab of cotton wool soaked in 10 per cent. Argyrol and mounted on a match stick is then inserted into the meatus and retained for a few minutes, following which an injection of 15-20 minims 10 per cent Argyrol solution is given into the urethra and retained for five minutes. The genitals are then thoroughly inuncted with 30 per cent. calomel ointment, and a piece of clean linen wrapped loosely round the penis the man is instructed not to urinate for at least two hours afterwards.

It is necessary to say a word in connection with the use of condoms, which are largely advocated in some quarters. Undoubtedly a condom which does not break and is removed with clean hands will protect the parts which it covers, but it is apt to prove a very frail reed if trust is placed in it entirely I have seen chancres at the root of the penis where the parts were uncovered, and also on the glans penis, though the sheath had not broken in this case the part had doubtless been infected with contaminated fingers.

The means of disinfection which have been described so far have been chiefly those which are applicable to large bodies of men, allowing for the most stupid by nature and

the stupid by reason of intoxication, but it may be well to add a method of disinfection which could be carried out by a person of ordinary intelligence and would perhaps give a more certain assurance of safety The method is as follows

As soon as possible after exposure to infection—

(1) Urinate
(2) Wash the whole genitals, pubis and lower abdomen with soft soap and warm water Dry
(3) Swab the same parts well with 1/2,000 Hydrarg Perchlor paying particular attention to the mouth of the prepuce corona, and frenum, all of which are particularly apt to be abraded
(4) Squeeze some semi fluid calomel and thymol cream into the urethra, and finish by inuncting the parts well with a stiffer calomel and thymol cream.

If disinfectant treatment has been delayed for some hours, it is safer to undergo also a modified abortive treatment as described on p. 286. The parts should be examined daily for many days afterwards, and advice sought at once for the least appearance of disease. For gonorrhœa can be aborted in a week or ten days if treatment starts on the first day of the disease as the results obtained at the Australian the New Zealand and the Rochester Row Abortive Treatment Centres have amply proved In this connection the reader is referred to pp 286–9 and the Argyrol injection treatment followed by irrigations with potassium permanganate solution is particularly recommended. Treatment on the very first appearance of a syphilitic sore also pays handsomely as frequently mentioned in this book.

Nothing has been said so far as to the early disinfection of women or the making of them non-contagious, the first for their own protection the second for the protection of the men with whom they consort From the point of

view of the general prevention of venereal diseases much less is to be expected from measures applied to women. The conditions under which the virus is implanted favour infection much more than in men, so that disinfectant measures are much less likely to be successful in preventing infection of the woman. Even if they were, women are naturally much less approachable in these matters than men, and it is only when the disease has become well developed that the great majority of the infected are likely to apply for assistance in the case of gonorrhoea this means when the disease has become practically incurable and the patient is likely to remain intermittently infectious for the remainder of her days. If a woman were to swab her genitals and between the labia with 1/2,000 perchloride of mercury and irrigate the vagina with the same solution immediately after connection, it is probable that in most cases, she would escape infection, but circumstances do not usually permit of these measures. When the disease has become chronic, a woman will not usually convey infection if she takes the precaution to abstain during and for a week after the menstrual flow and to irrigate immediately beforehand with perchloride lotion.

All things considered, it has always seemed to me that measures applied to women are only subsidiary to the main attack on venereal disease, and that the greatest effort should be concentrated on the chain of infection where it can most easily be broken, viz. after implantation of the virus on the genitals of the man.

That the breaking of the chain at this point is practicable and simple has, I hope, been abundantly shown above. It remains for the medical profession to convey the lesson to the lay public. When this has been done and the lesson has been thoroughly learnt, we shall see the end of Venereal Diseases.

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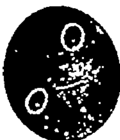

FIG. 1


FIG. 2


FIG. 3.

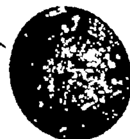

FIG. 4


FIG. 5

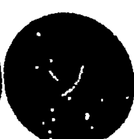

FIG. 6.


FIG. 7


FIG. 8.


FIG. 9.

DESCRIPTION OF PLATES XVII, XVIII AND XIX

PHOTOMICROGRAPHS OF SYPHILITIC AND OTHER SPIROCHÆTES BY MR. J E. BARNARD PRESIDENT ROYAL MICROSCOPICAL SOCIETY

(Reproduced by kind permission of the Medical Research Committee)

PLATE XVII

FIGS. 1 and 2. *S pallida* Coils very fine with, for the most part clear-cut spaces between them Comparison with the red cells shows seven coils to the diameter of the cell. Colour bluish or dead white not dazzling.

FIG 3 Spirochæte from genital sore Often confused with *S pallida* on account of the regularity and fineness of its coils. Comparison with *S pallida* shows it to have thicker coils; there are five of these to the width of a red cell. It is also more refringent.

FIG 4 Short spirochæte of three or four coils from a genital sore It usually moves very actively across the field and is easily distinguished from *S pallida* by its coarseness.

FIGS. 5 and 6. Spirochætes from genital sores—coarser much less regular and more refringent than *S pallida*.

FIG 7 *S dentium* from mouth. Coils tightly rolled, not so open as in *S pallida*

FIG. 8. *S dentium*. This form is almost impossible to distinguish from *S pallida* under dark-ground illumination; but its movements are rather stiffer and its coils more angular

FIG 9 Spirochæte from mouth. Coarser and much less regular than *S pallida*. Very similar to the organisms shown in Figs. 5 and 6.

Fig. 1

PLATE XVIII

Fig 1 *S pallida* Enlargement of Plate XVII, Fig. 2.

Fig _ Enlargement of Plate XVII, Fig. 3. Emphasizes the greater thickness which distinguishes this spirochete from *S pallida*.

FIG. 1

PLATE XIX

FIG 1 *S dentium* Enlargement f Plate XVII Fig. 7 Comparison of this with Plate XVIII Fig. 1 shows the tighter rolling of its coils in comparison with those of *S pallida*.

FIG 2 *S dentium* Emphasises the greater angularity of the coils of this spirochæte in comparison with those of *S pallida* (*vide* Plate XVIII Fig. 1).

Bistoury curved.
" straight.
Meatome, one.
Scalpels, say six.
Razor one
Probes, assorted, say six.
Dressings and antiseptics as in ordinary surgical practice
Irrigators (see p. 305).
Nozzles (see p. 303).
Tubing, rubber, ¼ in., say 6 yards.
" ⅛ in., say 6 feet.
Syringes, glass urethral, with conical tips, 2 drachms, say six.
" Ultzmann's, one
Bougies gum-elastic, acorn-tipped, sizes 4–24 F
" " olivary-tipped, sizes 4–24 F
Catheters, gum-elastic, sizes 4–16 F
soft rubber sizes 4–16 F
Harrison's whip, assorted sizes.
Jaxa Catheter
Sounds dilating, straight, sizes 10–32 F
curved, sizes 12/16 to 30/34 F (see p. 315).
Sounds, bladder two
Dilators, Kollmann's flushing (see p. 320).
Glasses, urine cylindrical with foot, say six.
Troughs, catheter enamelled iron or glass, say four
Steriliser fish-kettle.
Schimmelbusch pattern, for steaming "600" apparatus
Microscope, bacteriological, with objectives, 1/12 in.; 1/6 in. or 1/4 in.; and 2/3 in. or 1/2 in.
Condenser dark-ground, to fit above (see p. 234).
Stop for 1/12 in. objective of above.
Illuminant for above (see p. 250).
Forceps, Cornet, say two pairs.
Scarifiers for scraping lesions, say two.
Lamp spirit, or Bunsen burner
" pocket, flash-light, one.
Loops, platinum, preferably in metal holders, say two
Oil, cedar wood.
Tubes capillary (see p. 253).

APPENDICES

APPENDIX I

INSTRUMENTS AND APPLIANCES COMMONLY USED IN THE DIAGNOSIS AND TREATMENT OF VENEREAL DISEASES

Apparatus for the injection of "606" (see p. 354).

Bottles Roux, or flasks for containing solutions required in the preparation of "606."

Burette on stand for the delivery of sodium hydrate

Cylinders glass graduated and stoppered, for the mixing of "606."

Bottles, wide-mouthed and stoppered, for containing intravenous needles in alcohol.

Syringes hypodermic, all-glass, 20 and 40 minims

Record 5 c.c. and 10 c.c.

Needles steel, intramuscular 1½ in long } say six of each.
hypodermic.
gauge 56, 2½ in. long
" for intravenous injection

lumbar puncture (see p. 235) two

Depressors tongue.

Directors, assorted

Dishes enamelled iron or glass kidney-shaped, say two

18 in × 10 in say two

Gloves, rubber say six pairs

Cots, finger rubber say three boxes.

Forceps, dissecting say two pairs.

" pressure, say six pairs

" dressing, say three pairs.

" sinus, say two pairs.

" steriliser say one pair

APPENDIX II

STAINS USED FOR THE DEMONSTRATION OF MICRO-ORGANISMS

A. GRAM'S METHOD

(Jensen's modification)

THE following is recommended as a more reliable method of staining the gonococcus and other Gram-negative organisms than the original technique

Prepare

(a) Methyl violet	1 grm.
Distilled water	200 c.c.
(b) Iodine	1 grm.
Potassium iodide	[illegible]
Distilled water	100 c.c.
( ) Neutral red	0·2 grm.
Distilled water	100 c.c.

Dissolve and add 0·2 c.c of 1 per cent. solution of glacial acetic acid.

Technique —(1) After it has dried, fix the film by passing it three times through the flame taking care not to over-heat it *Allow to cool*, and pour on solution (a) which is allowed to act for 15–20 seconds

( ) Replace the stain with solution (b), which is allowed to act for one minute

(3) Replace the iodine solution with *absolute* alcohol after removal of the iodine, pour more alcohol on the slide, and rock the latter for a minute as in developing a negative finally give a quick rinse with fresh alcohol (The alcohol must be of a strength which is not less than 96 per cent.)

(4) Counter-stain with solution ( ), which is allowed to act for half to one minute

Pipettes capillary (see p 281).
Teats, rubber
Slide counting Fuchs and Rosenthal
Slides microscope, of thickness suitable for the dark-ground condenser
Slips, cover square thin
Mat, staining indiarubber
Stains of which the following are a useful selection
Methyl violet Gentian violet Thionin blue Fuchsine Methylene-blue Neutral red Leishman s.
Chemicals of which the following are indispensable
Absolute alcohol Iodine Potassium iodide Glacial acetic acid Xylol Sodium chloride Sodium hydrate; and for Leishman s stain, Methyl alcohol, acetone-free.
The following may be added with advantage Hydrochloric acid Picric acid Potassium hydrate Ammonium sulphate
Bottles, drop, for stains say of ·5 c.c. capacity
Filter paper 8 in and 4 in., in packets and in quires.
Funnels glass 4 in. one 1 in., four
Machine, centrifugal.
Outfits, blood taking (see pp 229–34)
Stands urine test.
triangular iron, two
Still, *e.g* Thorpe s Revenue

Note—The quantities mentioned in the above list are intended as a guide only

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Technique.—(1) After it ha dried, fix the film by passing it three times through the flame taking care not to over heat it. *Allow to cool*, and pour on solution (a) which is allowed to act f r 15–30 ec nds

(2) Replace the tain with solution (b), which is allowed to act f r one minute

(3) Replace the iodine solution with *absolute* alcohol; after remo al f the iodine pour more alcohol on the slide and rock the latter for a minute as in developing a negative; finally give a quick rinse with fresh alcohol. (The alcohol must be of a trength which is not less than 98 per cent.)

(4) Counter-stain with solution ( ), which is allowed to act for half t one minut

Gonococci and all other Gram negative micro-organisms stain red staphylococci streptococci, and all other Gram-positive micro-organisms stain black or purple.

B Loeffler's Methylene Blue

Saturated solution of methylene blue in alcohol	30
Solution of potassium hydrate, 1/10 000 (made by adding 1 c.c of 1 per cent. KOH to 99 c.c. water)	100

Technique.—Fix in the flame, cover with the stain, which is allowed to act for five minutes The slide is then washed with water and dried with filter paper

C Carbol Thionin

Thionin blue	1
Carbolic acid solution (1 in 40)	100

Technique.—As under B, but the stain should be diluted to one in three before use

For studying the cytology of pus, a suitable bloodstain should be used, of which the following is recommended

D Leishman's Stain

Leishman's stain in powder	0 15
Methyl alcohol, acetone free	100

Grind the stain to a fine powder in a clean mortar add a few drops of the alcohol and grind to a paste slowly add more alcohol while grinding until about 15 c.c. have been added. Allow to stand for a few minutes, to allow the undissolved particles to settle to the bottom decant into a clean bottle and repeat the process with the remainder of the solid stain in the mortar Continue until all the powder and stain have been transferred to the bottle. It is best to keep the prepared stain for three days, with frequent shaking before using it.

Technique—*For staining of ordinary films* allow the specimen to dry in air and, *without previous fixation*, drop sufficient of the prepared stain on it to cover it allow the stain to act for 15 seconds, and then add to it as many drops of *distilled water* as were used of the stain. Mix stain and water well, by drawing

a needle through them from end to end of the slide three or four times; allow the diluted stain to act for five to ten minutes, and then wash with distilled water. Leave some of the latter on the slide for fifteen to twenty seconds, wash off, and dry with filter paper.

Cocci stain blue; nuclei of leucocytes, rose-red; eosinophile granules red; protoplasm of mononuclear and coarsely grained eosinophile cells, light blue.

For staining of Spirochæta Pallida.—The slide or cover-glass, on which the film is to be made, must be perfectly clean and free from grease. Any of the methods recommended for the preparation of slides for flagellar staining will answer the purpose, but perhaps the simplest is to pass the slide thirty or forty times through the flame of a Bunsen burner.

The film must be as thin as it is possible to make it. The material may be lightly rubbed over the surface of the slide, or if of fluid consistency it may be spread by any of the means employed in the preparation of blood films. The stain and water in the usual proportion, of two parts of water to one of stain (which will be found to be contained in about the same number of drops), are mixed beforehand in a watch-glass, and poured directly on to the unfixed film. Optimum staining takes place in about twenty five minutes and the only additional precautions to be observed are that the distilled water used for washing off the stain must be employed with great gentleness, and that the blotting with cigarette paper must be done by slight pressure and without any rubbing. By this procedure the red cells are, of course, dehæmoglobinised and, in addition, a great deal of detritus is dissolved off from the film the leucocytes and tissue-cells remain and also bacteria, as well as the spirochætes, should any be present in the film. This method has the advantage that the greater freedom of the film from debris and extraneous matter makes the detection of the spirochætes easier. If the precautions mentioned above are observed, there does not appear to be any diminution in the number of spirochætes, when compared with a fixed film from the same case. On the contrary owing to the deeper staining of the spirochætes, they frequently appear to be more numerous than in the fixed films (Leishman).

Gonococci and all other Gram negative micro-organisms stain red staphylococci, streptococci, and all other Gram-positive micro-organisms stain black or purple.

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Solution of potassium hydrate 1/10,000 (made by adding 1 c.c. of 1 per cent. KOH to 99 c.c. water)	100

Technique.—Fix in the flame, cover with the stain, which is allowed to act for five minutes The slide is then washed with water and dried with filter paper

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Technique.—As under B, but the stain should be diluted to one in three before use

For studying the cytology of pus, a suitable bloodstain should be used, of which the following is recommended

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Technique.—For staining of ordinary films, allow the specimen to dry in air and, without previous fixation, drop sufficient of the prepared stain on it to cover it allow the stain to act for 15 seconds, and then add to it as many drops of distilled water as were used of the stain. Mix stain and water well, by drawing

one end of a clean slide and a drop of the collargol solution next to it. With the help of a platinum loop, the two are mixed and the mixture is spread with the end of another slide, as in making a blood film.

(3) **Benian's Modification of Burri's Method.**—Prepare the following:

(*a*) Congo red	2
Distilled water to	100

Filter before use.

(*b*) Hydrochloric acid	1
Absolute alcohol to	100

Technique.—On a perfectly clean slide place a drop of the exudate to be examined and a drop of solution (*a*) alongside it. Mix the two with the help of a platinum loop, and spread fairly thickly like a blood film. Allow to dry and then flood the slide with solution (*b*), which is allowed to act for one minute. The background is blue and the spirochætes stand out from it as white corkscrews.

E. Staining of Spirochæta pallida

(See Leishman's method on previous page)

Tribondeau's modification of Fontana's method

(1) A thin film of the secretion as free from blood as possible, is spread on a slide and allowed to dry. It is covered repeatedly for 1—5 minutes with the following (Ruge's) solution:

Pure acetic acid	1
Formalin 40 per cent.	2
Distilled water	100

Alcohol is dropped on the slide and then flamed.

(2) The following mordant is then applied:

Tannin (alcoholic or ethereal)	5
Hot distilled water	100

warming gently till steam rises, and then allowing to act for thirty seconds longer.

(3) The specimen is washed under the tap for a few seconds, the excess water thrown off and the slide covered with Fontana's solution, which is made as follows: To a 5 per cent. solution of silver nitrate, ammonia is added drop by drop with a capillary pipette until the sepia precipitate, which forms at first, disappears. To this solution is added more silver nitrate solution until a solution is left which remains slightly cloudy on shaking.

The slide covered with this solution is warmed gently till steam arises and the solution is then allowed to act for thirty seconds longer.

Spirochætes appear dark brown to black and are easier to find than in specimens stained by other methods. They are slightly thicker and this must be allowed for in coming to a decision as to their nature.

F. Demonstration of the Spirochæta pallida by Staining of the Background

(1) **Collargol Method.**—A solution of collargol is made by placing 1 part in a bottle with 19 of distilled water and shaking energetically.

A drop of the exudate from the suspected lesion is placed at

The injected solution to be retained for five or ten minutes and not more than one syringeful to be placed in the urethra at any time.

(6) Protargol — gr. iv
Distilled water — ℥ i

Dissolve by floating on cold water, and use in strengths increasing from 1 of solution to 8 of water to undiluted solution.

(7) Sulphate of zinc — gr xv
Subacetate of lead — gr xx
Tinctures of opium and of catechu, of each — ʒ ß
Water to — ℥ vi

Dilute at first with at least an equal quantity of warm water

(8) Ultzmann's Injection.
Zinc sulphate and powdered alum, of each — 4 to 12 grains
Carbolic acid — 4 minims
Water to — 6 ounces

Dilute with 1 to 4 parts of water

(9) Copper sulphate — gr ¼
Zinc sulphate — gr ¼
Water — ℥ i

Dilute with an equal quantity of water

(10) Collosol argentum undiluted.

(11) Argyrol 1–10 per cent.

Argyrol has a damaging effect on epithelium, and its rôle is rather in the abortive treatment, as its use should not be continued for many days.

APPENDIX III

SOME FORMULÆ FOR USE IN GONORRHŒA

For Irrigation

(1) Potassium permanganate	gr xx
Water	℥ xx
(2) Albargin	gr xl
Distilled water	℥ xx
(3) Silver nitrate	gr xx
Distilled water	℥ xx
(4) Mercury oxycyanide	gr xx
Water	℥ xx
(5) Picric Acid	℥ ii
Water	℥ xx

Each of the above should be diluted in the proportion of 1 to 3 ounces to each pint of water In the case of Formula (1) it is useful to add sodium carbonate gr lxxii to each pint of the dilute solution just before use. Formula (3) may be useful as a test of cure since it provokes a discharge in which gonococci are more easily found than in the ordinary discharge of a chronic case Formula (4) should not be used while the patient is taking iodine in any form. This applies also to the use of mercury perchloride. Formula (5) is useful in the declining stages commencing with 0 5 per cent. and increasing to 2 per cent.

For Injections.—To be used with a syringe of not more than 2 drachms capacity four or five times a day after urination.

The following plan of treatment may be used as an alternative to that mentioned in the text in those cases where it is desired to keep up the effect after the patient has received a considerable treatment with salvarsan and mercury:

(1) One month taking six pills a day
(2) Three days without pills.
(3) One month taking four pills a day
(4) Seven days without pills.
(5) One month taking three pills a day
(6) One month without pills.
(7) Three months taking three pills a day
(8) One month without pills.
(9) Three months taking two pills a day
(10) One month without pills.
(11) Three months taking one pill a day
(12) Three months without pills.
(13) One month taking one pill a day

In each of the intervals of one month, potassium iodide gr v increased to gr xx or xxx should be prescribed three times a day for two weeks.

Iodine Preparations.—Besides the preparations of iodine mentioned in the text, one or other of the following may be found useful: Lipoiodine, one to three tablets three times a day. Glutiodin tablets in similar amounts. Vin Nourry, an iodinated wine which is prescribed in doses of a tablespoonful three times a day with food; Iodeol, a colloid preparation, of which the contents of one ampoule are injected intramuscularly every day for fifteen days in one course.

MOUTH WASHES AND DENTRIFICES

(1) Potass. Chlorat	ʒ ii
Glycerin. Borac	ʒ i
Tr. Myrrh.	ʒ ii
Aq. Rosae ad	℥ viii
(2) Plumb. Acetat.	gr lxxx
Aq. ad	℥ viii

APPENDIX IV

FORMULÆ FOR THE MERCURIAL TREATMENT OF SYPHILIS BY THE MOUTH. OTHER IODINE PREPARATIONS. MOUTH WASHES

[*The oral administration of mercury is not recommended except when other methods are impracticable.*]

(*a*) Hydrarg. c. Cret. 1–2 grains three times a day

(*b*) Pil. Hydrarg. 1–2 grains three times a day

(*c*) Mercury salicylate [illegible] grain three times a day

(*d*) Tannate of mercury [illegible] grain three to five times a day

(*e*) Green iodide of mercury [illegible] to [illegible] grain three times a day

(*f*) Perchloride of mercury [illegible] grain two to three times a day

(*g*) Formula recommended for use in the French Army after completion of the usual salvarsan and mercurial courses:

Hydrarg. Protoiodide	gr. [illegible]
Extract. Opii	gr. [illegible]
Ext. Cinchonæ ad	gr. [illegible]
Fiat Pil.	gr. i

Commencing a month from the termination of the last course, the patient takes one pill on each of the first ten days of every month for a year.

(*h*) Perchloride is commonly ordered as a mixture from ½ to 1½ drachms of the liquor hydrarg. perchlor., being prescribed with some vegetable infusion. Iodide of potassium in the proportion of 5–20 grains is commonly added to each dose of the mixture, which is contained in 1 ounce. The result is biniodide of mercury with free potassium iodide.

(*i*) In Paris the perchloride is sometimes ordered in the form of a tablet to be dropped in the coffee or other drink.

INDEX

(3) Tr Iodi. ʒ iv
Aq ad ℥ viii

(4) Tr Myrrh
Tr Kramerie
Tr Cinchonæ
Tr Catechu aa. ʒ iv
Eau de Cologne ℥ i

A large teaspoonful of (4) in a wineglassful of water to be used as a mouthwash frequently (Whitla)

(5) Pulv Cinchon. Rub
Potass. Chlorat.
Lapid. Pumic
Cret Præcipit. aa. ℥ ii
Pulv Kramerie ℥ i
Saponis Alb ℥ iii
Ol Menth. Pip. ʒ iss
Sig—The dentrifice

(6) Cret. Præcipit. ℥ i
Mag Carb Pond. ʒ iii
Sapo. Pulv Dur ʒ iii
Thymol gr ii
Potass Chlorat gr xvi
Ol Menth Pip mm. xv
Sig—The dentrifice

In addition to the above it is valuable to instruct the patient frequently to suck lozenges or tabloids of potassium chlorate, and the internal use of belladonna may prove useful in checking salivation.